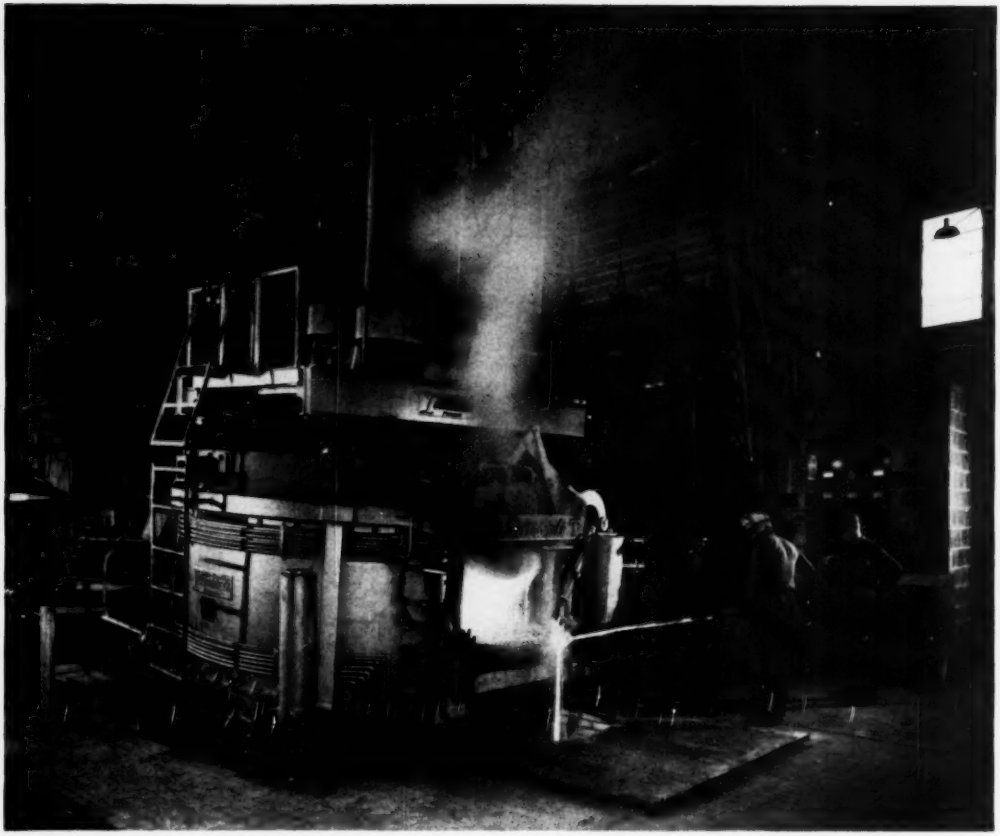
★ THE FOUNDRYMEN'S *Own* MAGAZINE

American Foundryman

NOVEMBER
1949



YOU'LL FILL more orders in less time with a Moore Rapid Lectromelt Furnace, like the Size OT pictured above, because Lectromelt Furnaces will melt more metal per turn for you. Lectromelt's famous topcharging features reduces down time for charging, keeps the furnace in operation more. And Lectromelt's precise controls provide for more efficient melting. You save time that means money with Lectromelt.

Lectromelt furnaces are available in sizes ranging from 100 tons to 250 pounds. Write today for detailed information.

PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH 30, PENNSYLVANIA

MOORE RAPID *Lectromelt* **FURNACES**

manufactured in: CANADA, Lectromelt Furnaces of Canada, Ltd., Toronto 2; ENGLAND, Birlec, Ltd., Birmingham; SWEDEN, Birlec Elektkougnar A/B, Stockholm; AUSTRALIA, Birlec Ltd., Sydney; FRANCE, Stein et Roubaix, Paris; BELGIUM, S. A. Belge Stein et Roubaix, Brassoux-Liege; SPAIN, General Electricc Espanola, Bilbao; ITALY, Forni Stein, Genoa.

"BOY, FETCH ME A SACK OF COLLOIDAL GELATINATING SILICATE OF ALUMINA!"

what the professor means is a bag of

FEDERAL GREEN BOND

Foundrymen know also that GREEN BOND controls sand strength; it rejuvenates dead sand; it gives greater sand flexibility; it permits sand to be worked with a lower moisture content; it is the most practical method of developing and controlling green strength. That's why FEDERAL GREEN BOND is used by foundrymen every day, everywhere.

Best of the Wyoming Bentonites

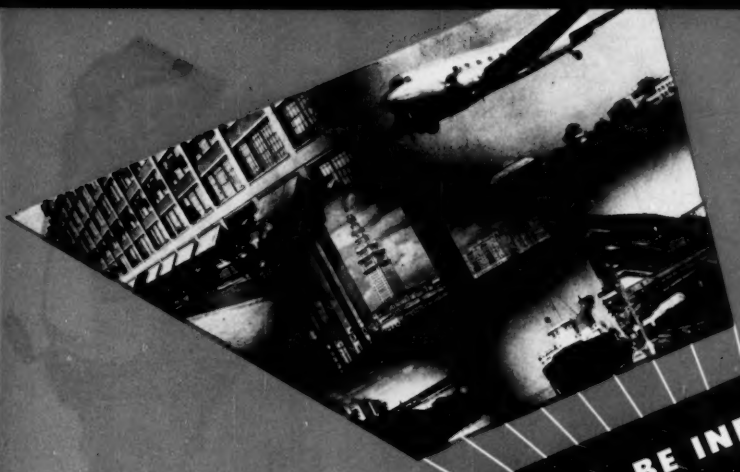
THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant — Mines

CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, WYO.

Wisner and Company, Commerce Station Box 71, Minneapolis 15, Minn. • Beaumont Cement Sales Co., Houston and Beaumont, Texas, and Harvey, La.
Pacific Graphite Co., Inc., 40th & Linden, Oakland 8, and 6025 District Blvd., Los Angeles, Calif. • Pacific Graphite Works, Oakland, Calif. • LaGrand Industrial Supply Co., Portland, Ore.
CANADA—Overseas Commodities Ltd., 2845 Grandview Hgy., Vancouver, B. C. • T. D. Barnes, 59 Sun Life Bldg., Hamilton, Ont. • Newman Foundry Supply, Ltd., 643 St. Paul St. W., Montreal, Que.
European Concessionaires: The District Chemical Company, Ltd., 1-19 New Oxford St., London W. C. 1, England



YOUR BUSINESS WILL BE INFLUENCED HERE

May 8-12

CLEVELAND

54th

A.F.S. FOUNDRY CONGRESS AND SHOW

All those interested in the development and manufacture of cast metals will watch events at Cleveland, when the industry meets at the A.F.S. Foundry Congress and Show, May 8-12. The newest methods, the newest equipment, will be presented to an industry at that time . . . under one roof . . . in harmony with the atmosphere that characterizes every A.F.S. Convention — **united progress through cooperative effort.**

It is the correct combination of events that make for a successful Congress . . . for the thousands of A.F.S. members and guests who will attend the technical events, the exhibits, and participate in the many social activities . . . for the firms with the foresight to join in this industry-wide gathering, the major foundry event of 1950.

Headquarters for the Meeting — Cleveland Public Auditorium — will be self-contained for an event of the scope of the 54th Foundry Congress and Show . . . a first class restaurant . . . attractive lounges . . . ample telephone facilities . . . suitable meeting rooms for the extensive technical program . . . ideal exhibit halls.

With hotel housing conditions back to normal, the 1950 A.F.S. Congress will attract the important influences from the foundry world, who will come to participate in events that will revolve around a Convention concentrated on **modernization and economy of production in the foundry.**

Cleveland Public Auditorium—May 8-12, Inclusive

AMERICAN FOUNDRYMEN'S SOCIETY

222 W. Adams St., Chicago

A. F. S.
NATIONAL OFFICERS

PRESIDENT
*E. W. Horlebein
Gibson & Kirk Co.
Baltimore, Md.

VICE-PRESIDENT
*Walton L. Woody
National Malleable & Steel Castings Co.
Cleveland

NATIONAL DIRECTORS

Term Expires 1950

E. N. Delahunt
Warden King, Ltd.
Montreal, Quebec, Canada

W. J. MacNeill
Dayton Malleable Iron Co.
Dayton, Ohio

*F. C. Riecks
Ford Motor Co.
Dearborn, Mich.

*John M. Robb, Jr.
Hickman, Williams & Co.
Philadelphia

*W. B. Wallis
Pittsburgh Lectromelt Furnace Corp.
Pittsburgh, Pa.

A. C. Ziebell
Universal Foundry Co.
Oshkosh, Wis.

Term Expires 1951

T. H. Benners, Jr.
T. H. Benners & Co.
Birmingham, Ala.

N. J. Dunbeck
Eastern Clay Products, Inc.
Jackson, Ohio

A. M. Fulton
Northern Malleable Iron Co.
St. Paul, Minn.

Robert Gregg
Reliance Regulator Corp.
Alhambra, Calif.

*V. E. Zang
Unicast Corp.
Toledo, Ohio

Term Expires 1952

T. E. Eagan
Cooper-Bessemer Corp.
Grove City, Pa.

L. C. Farquhar, Sr.
American Steel Foundries
East St. Louis, Ill.

V. J. Sedlon
Master Pattern Co.
Cleveland

F. G. Sefing
International Nickel Co.
New York

L. D. Wright
U. S. Radiator Co.
Geneva, N. Y.

*Member Executive Committee

PUBLICATIONS COMMITTEE

H. M. St. John, *Chairman*
Crane Co.
Chicago

C. H. Lorig
Battelle Memorial Institute
Columbus, Ohio

W. D. McMillan
International Harvester Co.
Chicago

H. J. Rowe
Aluminum Company of America
Pittsburgh

F. J. Walls
International Nickel Co.
Detroit

A.F.S. HEADQUARTERS
222 WEST ADAMS STREET
CHICAGO 6

Wm. W. Maloney, *Secretary-Treasurer*
S. C. Massari, *Technical Director*
Jos. E. Foster, *Technical*
A. A. Hilbron, *Convention & Exhibits*
H. F. Scobie, *Editor*
R. N. Sheets, *Assistant Editor*
C. R. McNeill, *Editorial*
John D. Murray, *Advertising*
Terry Koeller, *Promotion*

NOVEMBER, 1949

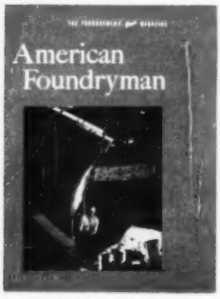
VOLUME XVI, NUMBER 5

American Foundryman

November, 1949

Official publication of American Foundrymen's Society

What Price Progress? W. L. Woody
Regional Conferences Help Meet Demands for Latest Foundry Facts
Plan Exhibits and Technical Programs for '50 Convention
Oxygen Injections Applied to Steel Melting: G. E. Bellew
1949 International Foundry Congress: A. W. Gregg
Michigan Regional Conference Sets New Attendance Record
Planned Foundry Dust Control: T. F. Hatch
Eastern Canada Chapter's Sherbrooke Meeting Stresses Gating and Risering: A. J. Moore
How FEF Policies Affect Students, Universities and Industry: G. K. Dreher
Choose Nominating Committee Members
Colorimetric Determination of Aluminum in Manganese Bronze: J. Carroll, I. Geld, and G. Norwitz
What's In a Name?
Ninth New England Regional Foundry Meeting Draws 350: W. M. Saunders, Jr.
Modern Foundry Methods—Engineering Metal Pattern Equipment: H. A. Burton
Quality Control Review—Test Procedures for Quality Control of Gray Iron Castings: F. J. Walls
Casting and Machining Pure Silver Bottles: W. C. Ellis
The Round Table
Letters to the Editor
Chapter Officers and Directors
New A.F.S. Members
Who's Who
Foundry Personalities
Chapter Activities News
Foundry Literature
Foundry Firm Facts
New Foundry Products
Advertisers' Index



This Month's Cover

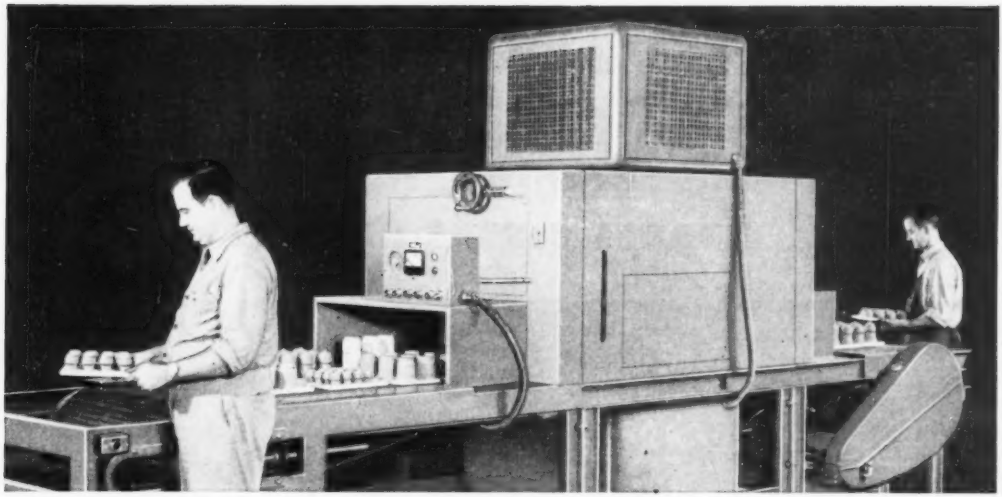
Casting shakeout at Elyria, Ohio, plant of Electro Alloys Div., American Brake Shoe Co. The sand falls through grates to conveyor for return to conditioning unit. Airborne dust is removed by hood over shakeout.

Published monthly by the American Foundrymen's Society, Inc., 222 W. Adams St., Chicago 6. Subscription price in the United States, Canada and Mexico, $3.00 per year; international, $6.00; single copies, 50c. Entered as second class matter July 22, 1938, under act of March 3, 1879, at the Post Office, Chicago, Ill. The American Foundrymen's Society is not responsible for statements or opinions advanced by authors of papers printed in its publication. AMERICAN FOUNDRYMAN is indexed regularly by Engineering Index, Inc.

Trademarks of Distinction

THESE and many other leading manufacturers in the automotive casting field protect their products with Tousey Casting Sealer. Tousey originated the manufacture of casting sealer to rigid specifications. Copies of these specifications, revised over the years to meet current needs, are available on request.

TOUSEY VARNISH CO., 520 W. 25th Street, Chicago 16, Ill.



Push-button baking of foundry cores

NOW you can have straight line, conveyorized, continuous core baking in a compact unit designed to save space, time, and labor!

Thermex High Frequency Core Baking Equipment produces superior foundry cores in a matter of minutes . . . cores that possess greatly improved shakeout and collapsibility characteristics.

With Thermex Core Baking Equipment, you'll save thousands of dollars annually in labor costs alone. The capacity of your mulling equipment is doubled. Far fewer mixes are required to produce a variety of cores. The labor involved in removing and re-racking core plates is eliminated . . . the cores go directly to the inspection table from your Thermex Core Baking Equipment. The cores themselves have no burned or broken surfaces to cause ridges, pits, or fins that must be removed from the castings.

How's that for saving costly man-hours that add up to cold, hard cash?

You'll want the complete, fact-filled story contained in our folder, "Thermex High Frequency Core Baking Equipment". It's interesting and it's important . . . to you. Send for your copy today!

Thermex

T. M. Reg. U. S. Pat. Off.

HIGH FREQUENCY CORE BAKING EQUIPMENT

The Girdler Corporation, Thermex Division

Louisville 1, Kentucky

FACTS about Thermex Core Baking Equipment

INSTALLED COST

Usually less than conventional ovens. Equipment—*complete with conveyor*—is simply placed in position and connected to power line.

OPERATING COST

Power is used only when cores are being baked and in proportion to the type and quantity. No power or time is lost in starting or in shutting down production.

MAINTENANCE COST

Negligible, because operation is remarkably simple. Only moving parts are the conveyor and exhaust blower. Push-button controls.

BINDER COST

Actually no more than the cheaper oil binders, because only one-third to one-half as much synthetic resin binder is required. A wide variety of proved resin binders is now available.

CASTING CLEANING COST

The labor normally required for correction of defects such as blow holes, pits, etc., in the casting is reduced to a minimum.

CORE TROUBLES?

4 WAYS TO GET BETTER RESULTS — USE KRAUSE CEREAL BINDERS

Yes — the qualities you need and want are yours in Krause's Cereal Binders—TRUSCOR (light weight) and AMERIKOR (heavy weight).

So why not take advantage of all these benefits by placing your next order with any of the distributors listed below or with us direct.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin

World's largest dry corn millers.

CEREAL BINDERS

DISTRIBUTORS

M. A. Bell Co.
Denver, Colo.
M. A. Bell Co.
Houston 2, Texas
M. A. Bell Co.
St. Louis 2, Mo.
A. L. Cavedo & Son, Inc.
Richmond 21, Va.
Foundry Supplies Co.,
Chicago 16, Ill.
J. H. Hatten & Son, Aldan,
Delaware Co., Pa.
J. B. Hayes Co.
Birmingham, Ala.
Independent Foundry Supply
Co., Los Angeles 11, Calif.
Marthens & Co., Moline, Ill.
Carl F. Miller & Co.
Seattle 4, Wash.
Milwaukee Chaplet & Mfg.
Co., Milwaukee 4, Wis.
Pacific Graphite Works
Oakland 8, Calif.
Porter-Warner
Chattanooga 2, Tenn.
Smith-Sharpe Co.
Minneapolis 14, Minn.
Frederic B. Stevens, Inc.
Buffalo 12, N. Y.
Frederic B. Stevens, Inc.
Cleveland 14, Ohio
Frederic B. Stevens, Inc.
Detroit 26, Mich.
Frederic B. Stevens, Inc.
New Haven 11, Conn.
Western Industrial Supply Co.
Portland 14, Ore.

for unusually good collapsibility

use CYCOR*191 synthetic resin binder

for sand cores and dry molds

For the kind of collapsibility that helps insure uniform, smooth casting, standardize on CYCOR 191 . . . Cyanamid's liquid synthetic resin binder for sand cores and dry molds.

There are many other reasons, too, for using CYCOR 191 . . .

You purchase only *neat* synthetic resin, introducing additives to meet your own particular requirements.

CYCOR 191 gives real savings in production and BTUs by speeding up baking time in conventional ovens 33% to 50%. Use of this product in dielectric ovens results in a cure time of only 2 - 5 minutes.

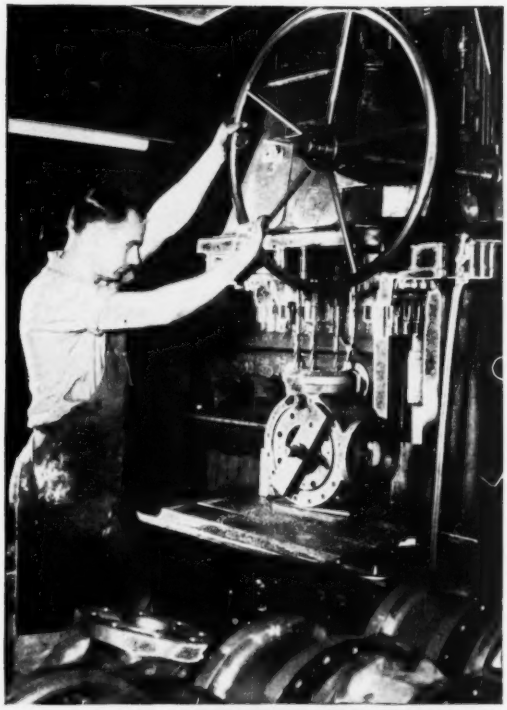
Yet CYCOR 191 costs no more than standard core oils.

Want more information? Write for instructions or technical assistance on the use of this product.

*Reg. U. S. Pat. Off.

AMERICAN Cyanamid COMPANY
PLASTICS DEPARTMENT
30-36 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Improving Machinability of MALLEABLE IRON CASTINGS



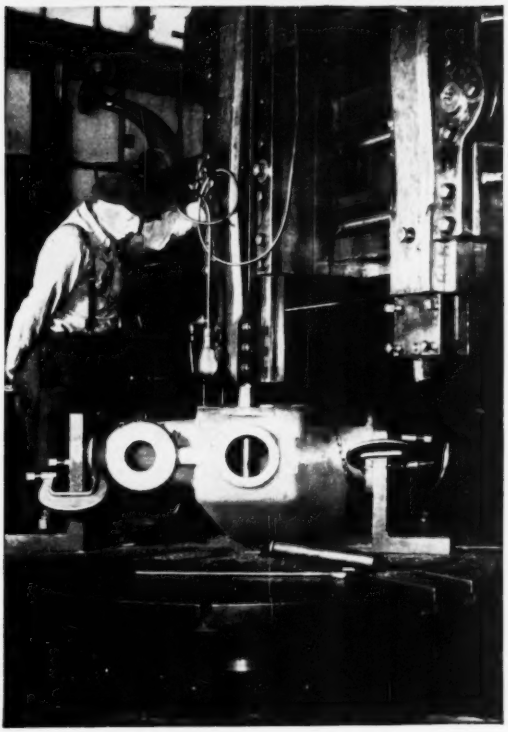
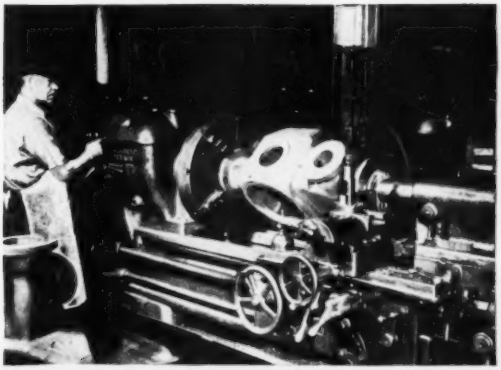
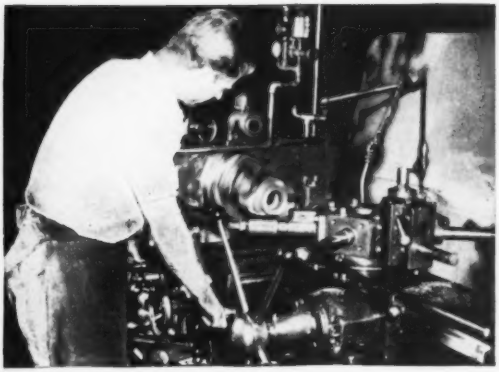


Photo Credit: Photos showing machining of castings, which have been treated with FERROCARBO Briquettes, are by the courtesy of the Rockwell Manufacturing Company, Pittsburgh, Pa. Castings were produced at Monnessen Foundry, a division of Rockwell.





3 IMPORTANT ADVANTAGES

are reported in machining castings which have been treated with FERROCARBO silicon carbide Briquettes.

1. Reduced machining time
2. Lower tool costs
3. Fewer rejected castings

The net result is realized in lower machining costs and increased profits. Complete detailed information on FERROCARBO Briquettes is easily obtainable from our metallurgical staff.

FERROCARBO Briquettes

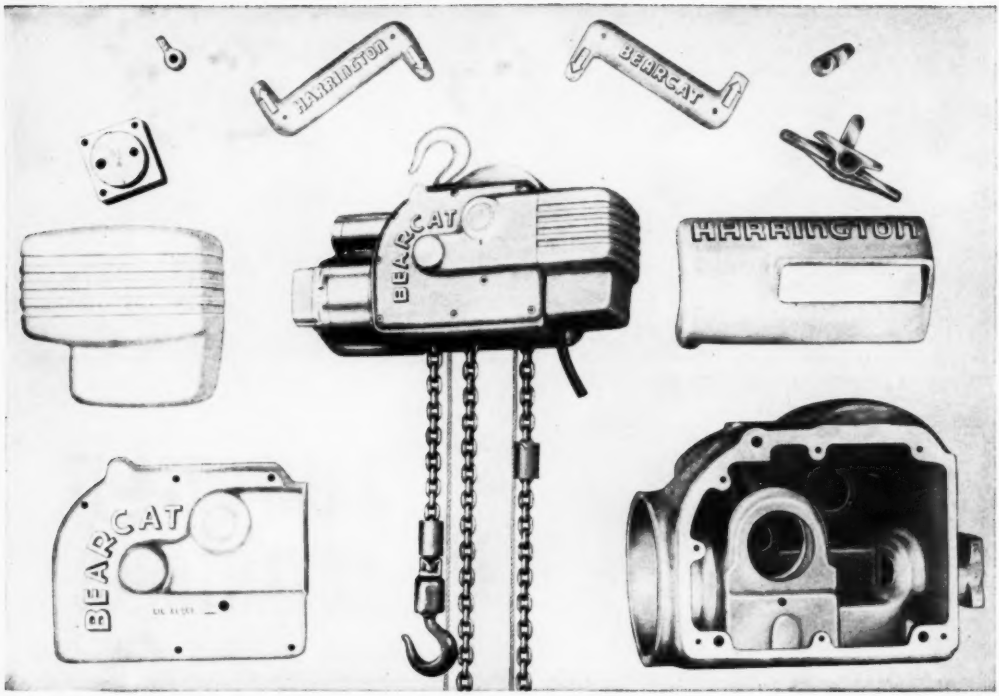
BY **CARBORUNDUM**

TRADE MARK

THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: Kerchner, Marshall & Co., Pittsburgh, Cleveland, Birmingham, Philadelphia and Buffalo; Miller and Company, Chicago, St. Louis and Cincinnati

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company



JM Leo. F90

Cut Weight, Eliminate Heat Treatment, Improve Properties — with TENZALOY

Casting ten parts of the Bearcat electric hoist (above) in TENZALOY enabled the manufacturer, The Harrington Company, Philadelphia, to:

1. Produce the article without heat treatment, thus saving an added expense.
2. Reduce castings' weight from an average of about 60 lbs. (original ferrous metal design) to 20 lbs., thus improving portability.
3. Cut machining and handling costs.
4. Improve appearance and corrosion properties, thus increasing sales appeal.
5. Virtually eliminate rejects.

The Fisher Casting Company, North Plainfield, N. J., which cast the components shown above, is a longtime user of TENZALOY. Its competent staff knows well this aluminum-magnesium-zinc alloy which Federated developed to give high strength without heat treatment. Therefore, when they recommended TENZALOY, and worked with Harrington and Federated engineers on the project, they were certain of its eventual success.

This happy and profitable experience can be yours, too. Write Federated's Dept. CW for technical pamphlet on TENZALOY.

Federated first in the non ferrous field. FMD

Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N.Y.

Kutztown Foundry and Machine Corporation
PRESSURE CASTINGS CHEMICAL EQUIPMENT SPECIAL MACHINERY
KUTZTOWN PENNSYLVANIA
ADDRESS ALL COMMUNICATIONS TO THE COMPANY
The United States Graphite Company,
1621 Holland Avenue
Saginaw, Michigan
Gentlemen:
Quality and appearance are only two of the exact-
ing demands required in the production of Still Castings
for the Chemical and Petroleum industries.
Photograph shows a Bell Tray for a 7'0" in diameter
Ammonia Still.
We used #70 Mexican Blacking on the mold to insure
a smooth, clean appearance.
Having successfully used this blacking in many
applications over a period of more than 15 years, can recom-
mend it to any one for similar service.
Yours very truly,
KUTZTOWN FOUNDRY & MACHINE CORP.
JEM:EM
General Manager
No. 70 Blacking
FOR SMOOTHER
CLEANER CASTINGS

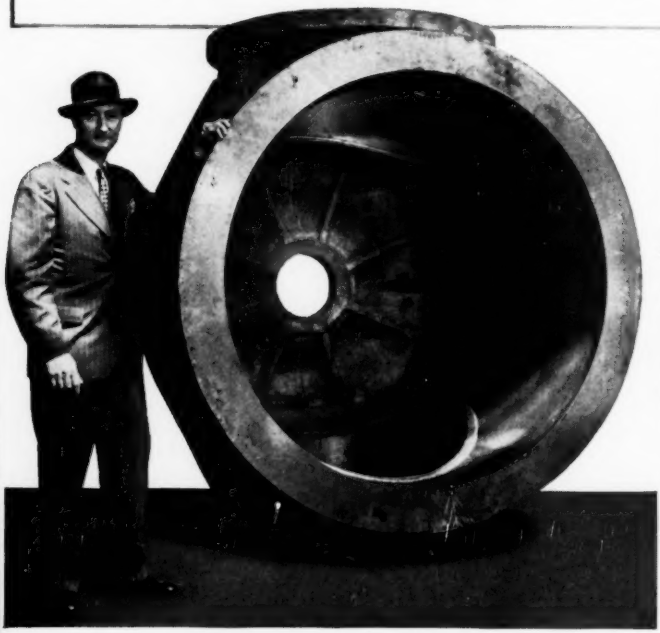
The smooth surfaces of this bell tray for a 7' diameter ammonia still, just one of a wide variety of castings produced by the Kutztown Foundry and Machine Corp. for the chemical and petroleum industries, require only a minimum of cleaning—thanks to No. 70 Blacking. No wonder Kutztown writes, recommending the use of No. 70 Blacking. This versatile mold coating penetrates deeply into sand surfaces to form a hard coat which turns out smoother, cleaner castings. It is economical and easy to use. No. 70 can be sifted dry through a cloth bag in treating green sand molds, for it draws sufficient moisture to bond to the sand; or it can be mixed with water to make an excellent wet blacking which assures a hard coat with maximum sand penetration for light and medium weight dry sand, skin dried and loam molds. It is also used by many production foundries to dip small baked cores which need extra protection under intense metal conditions.

- No. 70 Blacking, used by Kutztown in many applications for 15 years and preferred as a general purpose blacking by many other leading foundries, will help you to produce cleaner castings with less trouble and expense. Write for complete particulars.

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION

Chapman Valves meet ASTM "Class 50" specifications *with Nickel Alloy Cast Iron*



50,000 PSI MINIMUM TENSILE STRENGTH DEVELOPED IN VALVE CASTINGS WEIGHING UP TO FIFTEEN TONS EACH

Containing 2.00 per cent nickel, 0.25 per cent molybdenum and 0.75 per cent chromium . . . these vital units cast by The Chapman Valve Manufacturing Company of Indian Orchard, Mass., comprise key parts of the equipment being supplied for the Delaware Aqueduct by S. Morgan Smith Company, York, Pa.

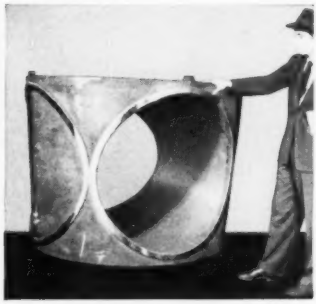
THE flow of a great underground river of Catskill mountain water for New York City will be controlled in subsurface valve chambers by these Chapman cone valves made of nickel alloy cast iron.

The nickel alloy iron adopted for these castings meets A.S.T.M. "Class 50" specifications, and provides sound, dense, high-strength units. Aqueduct valves, however, operate partially closed for long periods, and the resultant turbulence attacks surface metal of both seats and rings. To defeat this corrosive and erosive action, the Board of Water Supply specifies that these parts be faced with Monel*. The valve manufacturer applies Monel over a base layer of Ni-Rod*, the nickel electrode specially developed for cast iron welding.

Readily developing 50,000 p.s.i. tensile strength minimum, these valves exemplify how the right nickel cast iron not only helps foundrymen meet high mechanical property specifications, but the metal also assures trouble-free performance for the ultimate user.

Write for our recommendations regarding the best nickel alloyed iron for your applications.

*Reg. U. S. Pat. Off.



This cone for the 42" Chapman nickel iron valve body, pictured above, shows the Monel facing applied over a Ni-Rod base to provide maximum resistance to erosion and corrosion.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

NO UP-HILL CLIMB!
LEADING FOUNDRIES
THE EASY WAY TO OBTAIN AND MAINTAIN HIGHER CASTING QUALITY IS TO USE --
Famous
CORNELL CUPOLA FLUX

Constant use by leading foundries proves that Famous Cornell Cupola flux is quality insurance that pays off.

THE PROVEN RESULTS:

- Cleaner, hotter and more fluid metal.
- More fluid slag.
- Sulphur reduction.
- Sounder, tougher and cleaner castings.
- Easier machining.
- Reduced casting make-overs.
- Reduced cupola maintenance.
- Better casting deliveries.

Write for Bulletin No. 46-B.

TAKES PRACTICALLY NO TIME TO USE.
SCORED BRICK FORM saves digging out of container, weighing and measuring. You simply lift this pre-measured flux out of container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges. Being in solid form, the blast causes no loss up the stack.

NEW DIRECT REPRESENTATIVE:
On and after November 27, 1949, Chris T. Jensen, a native of Wisconsin residing at 2609 East High Street, Davenport, Iowa, will be our direct representative for state of Wisconsin.

MALLEABLE FOUNDRIES, with cupola operation, are showing a rapid trend towards the use of Famous Cornell Cupola Flux. Reports of greatly improved casting production come from every direction. Furthermore, there is a considerable reduction in cupola maintenance labor and cost. The life of cupola lining, whether brick or stone, is greatly prolonged.

The CLEVELAND FLUX *Company*

1026-1034 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

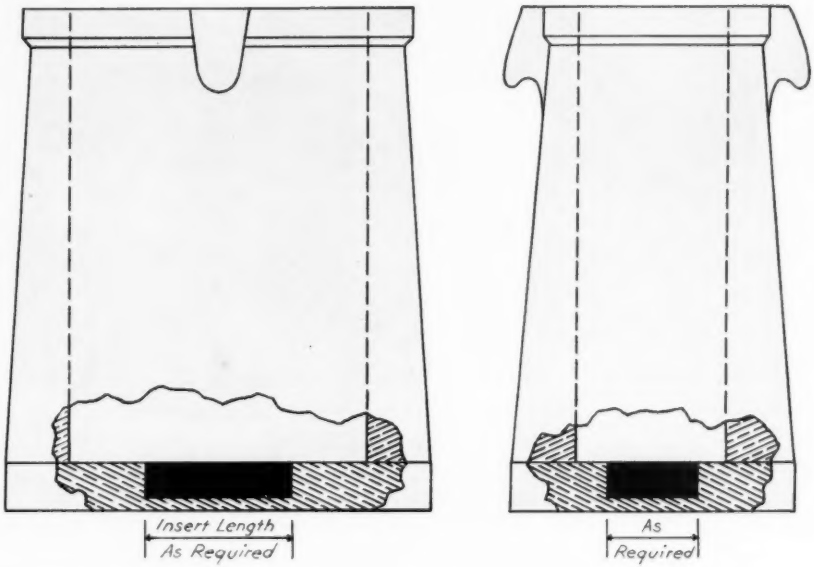
FAMOUS FLUXES
Trade Mark Registered

Write for Bulletins

Famous CORNELL ALUMINUM FLUX	*Famous* CORNELL BRASS FLUX	*Famous* CORNELL LADLE FLUX
Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.	Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.	Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

NO MORE STICKERS!

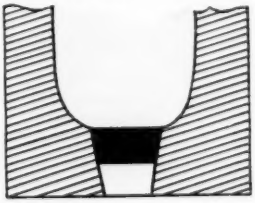
...when you use "NATIONAL" graphite stool inserts!



Use "National" graphite stool inserts in your open-bottom molds and you *eliminate stickers completely and forever!* Other advantages of graphite stool inserts are:

- They increase stool life by a wide margin
- Fewer stools are required – lower foundry costs
- They resist erosive action of falling molten metal

For more information on "National" graphite stool inserts, write to National Carbon Company, Inc., Dept. AF.

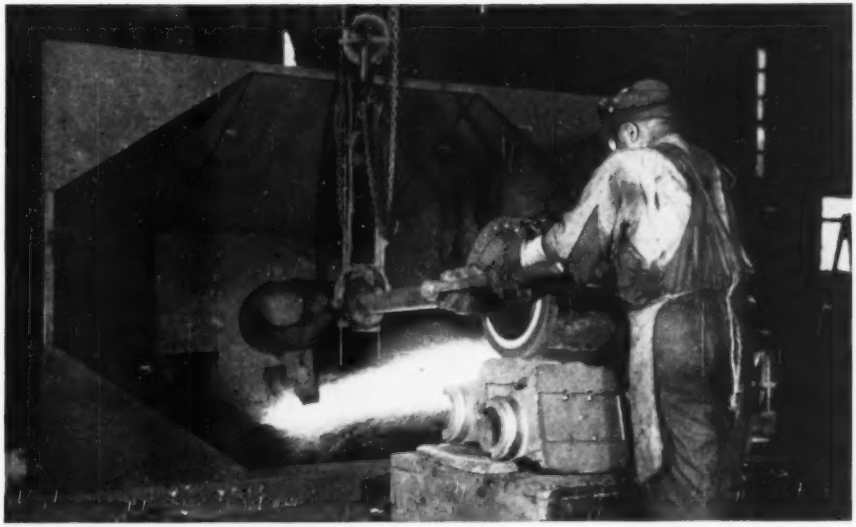


The term "National" is a registered trade-mark of
NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
Division Sales Offices:
Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

If you use plug-bottom molds, "National" carbon mold plugs save dollars. They last longer . . . weigh less . . . are truer to shape . . . won't stick, spall, or contaminate the ingot. Write us for complete details.

THESE PRODUCTS SOLD IN CANADA BY CANADIAN NATIONAL CARBON COMPANY LTD., TORONTO 4, CANADA

ROTO-CLONE makes a dust storm disappear for keeps



Swing frame grinder dust can now be controlled effectively — economically

THIS close-up photo of a swing frame grinder in operation tells the story of Roto-Clone* dust control better than words. Here's one of the worst offenders when it comes to producing dust, yet the surrounding atmosphere is clear and clean. It's the Type D Roto-Clone that does this job so effectively—and its advantages are many:

1. Constant Efficiency in dust separation under all operating conditions.

2. Uniform Air Volume, assuring proper suction at hoods and unvarying air velocities in pipe lines.

3. Small Space Requirement—functions of exhauster and separator combined in compact, self-contained unit.

4. Low Cost of System—Roto-Clone may be located at or near dust source, eliminating long pipes and the expense of outdoor installations.

5. Ease of Installation—requires only electrical and piping connections—no complicated parts assembly. May be readily moved to new location if desired.

That's why more grinders are exhausted by Type D Roto-Clone than any other type dust collector. And you have the choice of installing this system as a central type with main duct and branch connections or as an individual unit serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to address below.

Find Out How It Works To Save You Money!

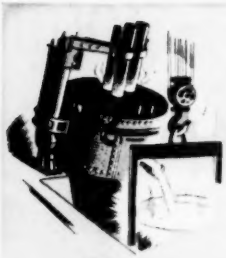
Write for Bulletin No. 272A describing the Type D Roto-Clone and its wide variety of applications.

AMERICAN AIR FILTER COMPANY, INC.
104 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*



Steelmakers are called upon to meet increasingly exacting requirements for cleanliness, quality, and chemical composition of steel. To help steelmakers produce these better steels, ELECTROMET has worked constantly to produce better ferro-alloys. Here are some of the reasons . . .

. . why

"ELECTROMET" Alloys

Trade-Mark

are preferred

1 UNIFORMITY OF ANALYSIS	ELECTROMET's specifications and dependable chemical analysis permit the use of the average analysis in calculating charges. In every shipment of ELECTROMET ferro-alloys, you obtain a uniform product resulting from close metallurgical and physical control.
2 WIDE RANGE OF SIZES	An adequate range of sizes, for both lump and crushed material, allows you to select the size best suited to your scale of operations and type of melting facilities for open hearth, electric furnace, or foundry.
3 GOOD SERVICE	ELECTROMET alloys are available for immediate shipment from plants and warehouses that are conveniently located to serve you. Sufficient stocks are kept on hand to meet the varied requirements of ferro-alloy users. Our staff of experienced metallurgical engineers is always ready to give technical help where needed.

The word "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation

Write for our new catalog "Electromet Ferro-Alloys and Metals." It describes over 50 metals and alloys produced by ELECTROMET and tells of the unique technical service offered to the metal industries.

ELECTRO METALLURGICAL DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham • Chicago • Cleveland • Detroit
New York • Pittsburgh • San Francisco
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario
Warehouses: Chicago • Los Angeles • Oakland, Calif. • Portland • Sheffield, Ala.

A NEW ERA IN PATCHING CUPOLA LININGS WITH the BONDACT Process.

IT'S NEW • IT'S REVOLUTIONARY • IT'S FAR BETTER

The Bondactor is a pressurized machine which meters and feeds a dry refractory mixture at almost any desired rate or volume at any location convenient to an air line or air compressor, feeding uniformly and without pulsation.

REVOLUTIONIZES PATCHING AND LINING OF CUPOLAS...

No more hard and soft spots due to uneven patching! Steady, uniform feeding saves hard manual labor and lines your cupola, ladle or furnace in ¼ to ½ the time heretofore required, greatly reducing down time. Your lining has maximum density and maximum refractory life. You have full control over moisture content, which is low, over density of patch and contour of patch. Extensive aging of monolithic materials is no longer necessary; storage space is reduced. Since Bondactor delivers unusual density and strength, you can use the highest quality ganisters with minimum clay and water content. Finally, you get low burn-out, uniform burn-out per day, uniform melting conditions and better all-around cupola performance. Why not see what the proven Bondact process will do for you?

Ask for our well illustrated 8-page Bulletin "B".

EASTERN CLAY PRODUCTS, INC., JACKSON, OHIO

ECP

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

LESS HORSEPOWER REQUIRED with SIMPSON MIXERS

Obviously, the lower horsepower required to do an efficient, thorough sand preparing job, the lower the cost—for power and for maintenance. In Simpson Intensive Mixers, you are assured of the lowest horsepower per ton of properly prepared sand . . . made possible by these engineering features:

In the Simpson, sand lies upon a stationary pan, power being required only for working the sand—by rolling the mullers over the sand which the plows have windrowed into the muller path.

Second, the well-balanced design and precision workmanship of all moving parts reduces friction, which reduces heat, thus requires less horsepower.

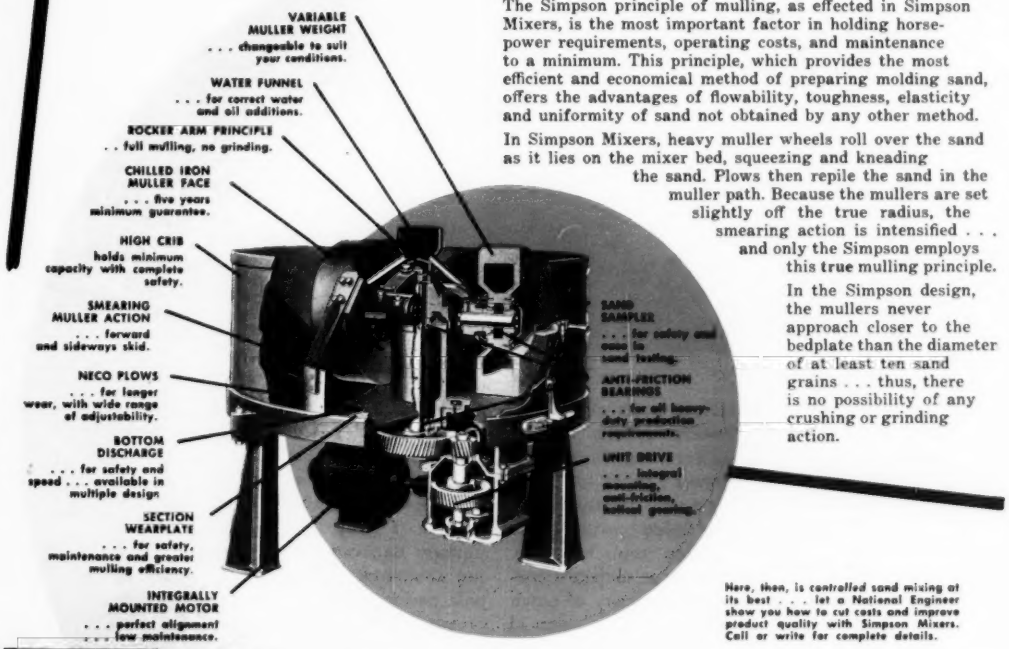
Listed below are some of the advanced engineering features responsible for the dependable, long-life operation of Simpson Mixers in all classes of foundries, on the toughest sand preparation problems.

The Simpson Principle of Mulling

The Simpson principle of mulling, as effected in Simpson Mixers, is the most important factor in holding horsepower requirements, operating costs, and maintenance to a minimum. This principle, which provides the most efficient and economical method of preparing molding sand, offers the advantages of flowability, toughness, elasticity and uniformity of sand not obtained by any other method.

In Simpson Mixers, heavy muller wheels roll over the sand as it lies on the mixer bed, squeezing and kneading the sand. Plows then repile the sand in the muller path. Because the mullers are set slightly off the true radius, the smearing action is intensified . . . and only the Simpson employs this **true** mulling principle.

In the Simpson design, the mullers never approach closer to the bedplate than the diameter of at least ten sand grains . . . thus, there is no possibility of any crushing or grinding action.


VARIABLE MULLER WEIGHT . . . changeable to suit your conditions.
WATER FUNNEL . . . for correct water and oil additions.
ROCKER ARM PRINCIPLE . . . full mulling, no grinding.
CHILLED IRON MULLER FACE . . . five years minimum guarantee.
HIGH CRIB holds minimum capacity with complete safety.
SMEARING MULLER ACTION . . . forward and sideways skid.
NECO PLOWS . . . for longer wear, with wide range of adjustability.
BOTTOM DISCHARGE . . . for safety and speed . . . available in multiple design
SECTION WEARPLATE . . . for safety, maintenance and greater mulling efficiency.
INTEGRALLY MOUNTED MOTOR . . . perfect alignment . . . low maintenance.
SAND SAMPLER . . . for safety and ease in sand testing.
ANTI-FRICTION BEARINGS . . . for all heavy-duty production requirements.
UNIT DRIVE . . . integral mounting, anti-friction, helical gearing.

Here, then, is *controlled* sand mixing at its best . . . let a National Engineer show you how to cut costs and improve product quality with Simpson Mixers. Call or write for complete details.

SIMPSON Intensive MIXERS

NATIONAL *Engineering Company*

600 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

WHAT PRICE PROGRESS?

A GOOD BUSINESS manager scrutinizes each item of expense periodically, endeavors to weigh the relative merits of each, and then reduces costs wherever it seems wise to do so.

In the foundry business—as in all business—to stay in the forefront of competition requires continuous progress toward lower costs. But no one guiding a business enterprise wishes to reduce the factors which do most to keep his company in the van of his industry. The wise manager realizes this means constant education of the man on the job.

To the few top men in management, various trade and management organizations supply the forum and leadership for the discussion of problems pertaining to trade matters. But for the largest group of men in the foundry industry . . . whose daily work brings them face to face with the technical aspects of all phases of production and research . . . and for the development of men for such work . . . the American Foundryman's Society meets the need and offers maximum information at minimum expense.

Members of this over-all foundry technical society number over 10,000 and belong to 47 chapters throughout North America. Representing the most progressive foundries, they keep their knowledge of foundry practices expanding and their technical wits sharpened by study of the most recent works of all other members of this vast organization.

The information is made freely available through the week-long Annual A.F.S. Convention, the annually published TRANSACTIONS, the monthly magazine AMERICAN FOUNDRYMAN, a number of special publications, and almost 400 chapter meetings and regional foundry conferences held each year.

New foundry equipment and supply developments are shown at the Society's biennial Foundry Show—next will be in Cleveland, May 8-12, 1950—and through the commercial advertising and editorial content of AMERICAN FOUNDRYMAN. Chapters of the American Foundrymen's Society maintain close contact with all types of educational institutions and sponsor local competition in the annual A.F.S. Apprentice Contest. The Society carries on research in all phases of the industry, with the ultimate goal of applying the new information developed to solution of practical foundry problems.

The American Foundrymen's Society has joined hands with the various foundry trade associations in supporting the Foundry Educational Foundation in the education of young college men for our industry and of others who later will specify or use castings.

Foundry Management interested in the advancement of its men should have a company or sustaining membership in the American Foundrymen's Society and all of the technical and supervisory men should have affiliate memberships. All medium and large size foundries might well support this fine and necessary cooperative work with a sizeable sustaining membership.

Foundry Management, when you evaluate your expenses in these critical times you will want to step up, rather than step down, your interest and participate to the fullest extent in the over-all foundry technical organization—the American Foundrymen's Society.

Walton L. Woody

WALTON L. WOODY
Vice-President
AMERICAN FOUNDRYMEN'S SOCIETY

A.F.S. Vice-President Walton L. Woody, vice-president of National Malleable & Steel Castings Co., Cleveland, has been part of the company's management staff for many of the years he has been with the organization. He has spent his entire foundry career with National Malleable, having started as a student laboratory worker in 1914 after graduating from Rose Polytechnic Institute with a degree in chemical engineering. After a few months in the company's Indianapolis plant he was transferred to the Toledo plant for a short time in the same capacity. That same year Mr. Woody was appointed a chemist in the headquarters plant at Cleveland where he later became, successively, metallurgist, melter, and assistant superintendent. Following this he managed the Chicago, the Cleveland, and the Sharon plants before assuming his present position. Vice-President Woody is a Past National Director of the American Foundrymen's Society (1943-1945) and has been active in the A.F.S. Malleable Division.

REGIONAL CONFERENCES HELP MEET DEMAND FOR LATEST FOUNDRY FACTS

"Old Stone Mill," Stevens Institute, where most Metropolitan Regional Foundry Conference Meetings were held.

INTEREST IN REGIONAL FOUNDRY MEETINGS has reached a new high with eight regional foundry conferences and the two-day meeting of the Eastern Canada Chapter scheduled for 1949-50. Most recent regional gatherings were held at Stevens Institute of Technology, Hoboken, N.J., October 21 and 22 (reported below), at Michigan State College, East Lansing, Mich., October 28 and 29 (page 31), and at Purdue University, Lafayette, Ind., November 3 and 4 (story in December issue).

The special meeting of the Eastern Canada Chapter, Sherbrooke, Que., September 30-October 1 (page 36), was in lieu of a Canadian Regional Foundry Conference which henceforth will be held in alternate years. The next is scheduled for Hamilton, Ont., in 1950. A story on the New England Regional Foundry Conference, held October 7 and 8 at Massachusetts Institute of Technology, Cambridge, appears on page 47.

Three Chapters Meet In Hoboken

Joining forces for the third time to sponsor a regional foundry conference, the Metropolitan, Chesapeake, and Philadelphia Chapters planned and executed the two-day meeting at Stevens Institute. With round table discussions on gating and risering, a variety of technical papers, a showing of the A.F.S. research film on fluid flow, and a session on nodular iron, the conference appealed to production, technical, and management representatives of foundries located within the Metropolitan area.

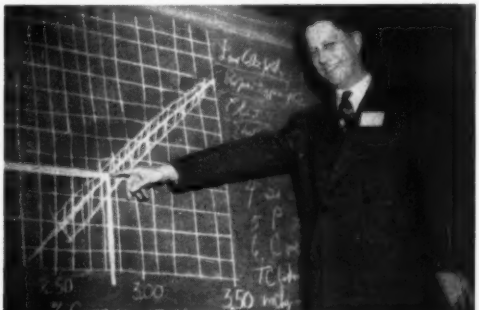
Following registration in the administrative building of Stevens Institute, the conference was opened the morning of October 21 by General Chairman Harold L. Ullrich, Sacks-Barlow Foundries, Inc., Newark, N.J. Stating that he felt the foundry industry would progress "through cooperative exchange of information such as is possible at regional conferences and chapter meetings" he introduced Harvey N. Davis, president of Stevens Institute of Technology. In welcoming conference attendants, Mr. Davis said that the school expected to learn more from the foundrymen than the foundrymen would learn from the conference.

"No one ever listened himself out of a job," said A.F.S. National President E. W. Horlebein, quoting Calvin Coolidge. He went on to point out that the educational value of foundry conferences could be extended through questions directed at speakers and discussion leaders and charged the audience with the responsibility of drawing out additional information and giving of their own experiences in return.

Three simultaneous round table discussions on gating and risering occupied the balance of the morning. Discussion leader at the gray iron meeting was Harry Kessler, Sorbo-Mat Process Engineers, St. Louis. E. C. Troy, foundry engineer of Palmyra, N.J., led the steel meeting while A. J. Howarth, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N.J., headed the discussion for the bronze and light metal group.

Mr. Kessler started the gray iron discussion by outlining a system for calculating riser size based on casting weight, section to be risered, and class of iron being poured. Casting weight multiplied by 0.04, 0.10, 0.16, 0.22 and 0.35, for ASTM Class 30, 35, 40, 50, and 60 iron, respectively, gives the weight of the riser as a general rule, he said. The factor may be reduced if many cores are involved. Riser diameter should be 1½ times the casting section to be fed with riser height twice the diameter. Round, not square risers were recommended and top risers should be avoided, the speaker said, because they create a T section which may lead to spongy, open grain iron immediately below the riser.

E. C. Troy led a discussion on the various types of gates and risers for steel castings which eventually got around to a major steel foundry problem—penetration. The speaker explained the importance of heat transfer in rapidly lowering the viscosity of the molten metal and thus preventing it from flowing around the sand grains. "An understanding of heat transfer is the most significant problem of the foundryman," said Mr. Troy, a member of the A.F.S. Heat



Frederick W. Hanson, Electro Metallurgical Div., Union Carbide & Carbon Corp., illustrates a point during his talk on carbon control in cast iron.

Transfer Committee. Foundrymen spend their lives putting heat into and taking it out of metals, he added.

A. J. Howarth outlined the functions of a gating and risering system for non-ferrous metals, how to achieve the desired goals, and the operating variables which adversely effect even the best systems. He recommended that the cross sectional area at the entrance to the mold be somewhat larger than the casting section at that point and suggested that gate width be approximately three times the gate thickness. Continuing with his discussion of Bendix Aviation gating and risering techniques, he said gate length should be somewhat greater than gate width and that the number of gates was indicated by spacing the gates approximately twice their width apart.

Parting line gates may be used if the metal has to drop only three or four inches, Mr. Howarth said, but he recommended bottom gating for best results on large castings. Runner cross section should be about 10 per cent greater than the total gate area, should extend into the cope, and should be about 50 per cent higher than its width at the base, the speaker said. Velocity of metal flowing into the gate is reduced by making the cross sectional area of the sprue about 50 per cent of the total gate area.

Among notables attending the Metropolitan Regional Foundry Conference were, left to right, Dr. Alfred Boylemann, Stevens Institute of Technology; A.F.S. National President Edwin W. Horlebein; Philadelphia Chapter Chairman W. A. Morley, Link-Belt Co.; Metropolitan Chapter Chairman Thomas J. Wood, American Brake Shoe Co.; Harold A. Ullrich, Sacks-Barlow Foundries, Inc., Newark, N. J., General Conference Chairman; and Dr. Harvey N. Davis, president, Stevens Institute. (Photos courtesy John Bing, Metropolitan Refractories Corp., New York.)

Two sets of three simultaneous sessions were held the afternoon of the first day. At the early afternoon gray iron session Frederick W. Hanson, Electro Metallurgical Div., Union Carbide & Carbon Corp., New York, spoke on "*Carbon Control in Cast Iron.*" Technical chairman was R. A. Flynn, American Brake Shoe Co., Mahwah, N.J.

"Carbon control consists of obtaining iron of predetermined carbon content of the desired temperature and quantity at will," said Mr. Hanson. It is necessary to control the carbon content of the material going into the cupola and to control the change in carbon during melting, he added. The speaker covered methods for producing carbons of any desired range and discussed the importance of the form of the carbon in relation to ultimate casting use.

C. A. Robeck, Gibson & Kirk Co., Baltimore, spoke on "*Non-ferrous Foundry Practice*" at the early afternoon bronze and light alloys meeting. Earl Bush, U.S. Naval Gun Factory, Washington, D.C., was technical chairman. At the outset Mr. Robeck emphasized the importance of keeping and using records as a significant factor in good foundry practice. Care should be exercised in purchasing raw materials, particularly where rigid castings specifications must be met, the speaker explained.

Segregation of incoming material is necessary and the safest way to keep the material from losing its identity is to keep it off the floor and in suitable bins and containers, Mr. Robeck declared.

No shop is too small to keep melting records, said the speaker in describing a melting record card to be punched on a time clock to indicate various steps in a heat. Melting techniques were described with emphasis on consistency and on recording temperatures.

In the molding department, preferences and requirements in molding sand vary widely among foundries yet it does not seem to prevent them from producing sound usable castings, Mr. Robeck said. All the necessary information to completely describe the sand which is giving good results should be recorded and used whenever sand is ordered.

Identification of castings leaving the pouring floor will help move them through the cleaning room at the desired rate, Mr. Robeck declared, and will help meet production schedules. He concluded with a discussion of preparation and use of the scrap report.

"*Microstructure and Mechanical Properties of Cast Steels*" was the subject of Malcolm F. Hawkes, Carnegie Institute of Technology, Pittsburgh, speaking at the early afternoon steel session. Chairman of the session was Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa. Professor Hawkes described and showed the microstructures of a number of carbon, and medium and low alloy, cast steels after various annealing and normalizing treatments. Temperature at which austenite transforms on cooling is the fundamental variable controlling microstructure, he said.

The late Friday afternoon sessions consisted of another round of three simultaneous meetings. At a gray iron and malleable session, Jos. A. Gitzen, Delta

Oil Products Co., Milwaukee, spoke on *"Mold & Core Sand Additives."* Chairman was George F. Watson, American Brake Shoe Co., Mahwah, N. J. Plaster mold casting was described by Claude M. Lambe, U. S. Gypsum Co., Chicago, at a bronze and light alloys meeting with B. A. Miller, Baldwin Locomotive Works, Eddystone, Pa., presiding. Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, discussed relation of steel foundry sands to casting defects at a steel session. Edward Berry, Dodge Steel Co., Philadelphia, was technical chairman.

Water, Mr. Gitzen said, is the cheapest sand additive but excessive and uncontrolled use can make it the most costly. He traced the development of sand binders and additives from before 1900 to the present.

In discussing plaster molds, Mr. Lamb told how they had progressed from permeabilities of less than one to about 30. Excess water gives the plaster permeability and flowability but decreases the compressive strength, he said. Expansion occurs during setting of the plaster but contraction occurs during subsequent baking out of the moisture.

Results of recent research at Massachusetts Institute of Technology were described by Prof. Taylor at the steel session. Study of the mold-metal interface reaction has shown, he said, that it is the result of oxidation of the iron at the interface followed by the formation of fayalite from the iron oxide and silica. A small-scale test was developed to reproduce commercial behaviour of molten steel poured in sand molds. Pinholes were determined to result from a carbon-oxygen reaction to form carbon monoxide, contradicting the currently accepted hypothesis that pinholes are formed by the reaction between hydrogen and oxygen to form water vapor, he said.

Show A.F.S. Fluid Flow Film

Two general sessions were held on Saturday, October 22, the first on fluid flow, the second on nodular iron. The A.F.S. research film, *"Fluid Flow in Transparent Molds,"* was shown at the first session with L. W. Eastwood of Battelle Memorial Institute, Columbus—where the research was conducted—as narrator. Dr. Eastwood explained the testing of various types of runner boxes, sprues, and ingates as they were shown on the screen, pointing out important details of flow. These were illustrated in slow motion by the flow of water containing a suspension of aluminum powder. Tiny holes in the transparent plastic mold showed how negative or positive pressures can develop with the passage of a fluid through different sprues. Negative pressure results in sucking air through the mold and into the metal where it may remain and cause a defect.

Attendants at the final session of the conference heard W. C. Mearns, International Nickel Co., New York, briefly describe the properties of nodular irons with which the company has worked.

Mr. Mearns showed that nodular iron has higher tensile strength and ductility than gray cast iron and he exhibited test specimens and castings produced from the material. Foundries, he said, are making castings with chilled surfaces backed up with nodular iron.

Members of the Regional Conference Committee, in addition to Chairman Harold L. Ullrich, Sacks-Barlow Foundries, Inc., Newark, N. J., were: Thomas J. Wood, American Brake Shoe Co., New York; William A. Morley, Olney Foundry Div., Link-Belt Co., Philadelphia; J. B. Mentzer, Wood-Embly Brass Co., Waynesboro, Pa.; Frank B. Eliason, Pennsylvania Foundry Supply & Sand Co., Philadelphia; John A. Bukowski, Worthington Pump & Machinery Corp., Harrison, N. J.; C. Louis Lane, Florence Pipe Foundry & Machine Co., Florence, N. J.; Blake M. Loring, U. S. Naval Research Laboratory, Washington, D. C.; George Baer, Atlas Foundry Co., Irvington, N. J.; B. K. Price, Penton Publishing Co., New York; H. J. Williams, New Jersey Silica Sand Co., Millville, N. J.; Robert J. Maddison, Whitehead Brothers Co., New York; and H. A. Robinson, Republic Steel Corp.

Medalist F. L. Wolf Dies

A.F.S. Gold Medalist and a Past National Director of the American Foundrymen's Society, Fred L. Wolf, 64, died September 27 in Ann Arbor, Mich. Mr. Wolf had been retired since 1945, following a strenuous tour of European foundries as a special investigator for the Government. Long active in A.F.S. technical work Mr. Wolf headed or was a member of many committees on sand, malleable iron and non-ferrous foundry practices. In addition, he was active in committe work for several other technical and engineering societies.

F. L. Wolf

Born in Elmore, Ohio, in 1885, Mr. Wolf received his early schooling there and in Toledo, and in 1908 was graduated from the University of Michigan with a B.S. in Chemical Engineering. Following two years spent at Cobalt, Ont., in charge of development work on mining claims, Mr. Wolf joined the Ohio Brass Co., Mansfield, Ohio, as a chemist. He had been technical superintendent and chief engineer of Ohio Brass for many years when, in 1942, the Government called him to Washington, D. C., to head the Graphite Section of the WPB Mica Graphite Division.

In 1943 Mr. Wolf was appointed deputy chief of the Mica Graphite Division. As World War II drew to a close in 1945, he was appointed a special investigator for the Government's Technical and Industrial Intelligence Committee.

Mr. Wolf's many years of activity in A.F.S. technical affairs included chairmanship of the Committee on Specifications for Non-Ferrous Metals, and membership in the A.F.S. Sand Research Executive Committee, and the Malleable Division's Advisory and Handbook Committees. He also served as A.F.S. representative to several committees of the American Society for Testing Materials. He was awarded the A.F.S. John A. Penton Gold Medal in 1940 for his contributions to the advancement of the science of non-ferrous metallurgy.

PLAN EXHIBITS AND TECHNICAL PROGRAMS FOR '50 CONVENTION

FLOOR PLANS AND SPACE APPLICATIONS for the 1950 A. F. S. Foundry Congress and Exhibit, to be held in the Municipal Auditorium, Cleveland, May 8-12, 1950, are now being completed and will be mailed to all exhibitors of record prior to December 1. Simultaneously, the technical program of the 1950 Foundry Congress is nearing completion and foundrymen desiring to present papers at the Convention are reminded that December 15 is the last day on which papers will be accepted. Papers should be sent to American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

Approximately 125 entry blanks for the 1950 A.F.S. Apprentice Contest have to date been sent to interested A.F.S. Chapters and plants, ranging geographically from the Atlantic Seaboard to the West Coast, who have already made preparations for holding local contests in conjunction with the A.F.S. National Contest. The event will be climaxed by presentation of awards to top winners at the 1950 Convention.

Many equipment and supply manufacturers have already evidenced considerable interest in the 1950 Exhibit and have indicated their intentions of concentrating their 1950 sales efforts on displays.

Plan Show From Three-Way Standpoint

As at the 1946 Show, the heavy operating exhibits again will be assigned space in the Lakeside Halls of the Cleveland Auditorium, both upper and lower levels, where numerous dramatic demonstrations will be presented. Closely related exhibits will be assigned space in the same halls, where the exhibitors desire, and the same policy of grouping more or less related types of displays will be followed in the Arcade, North Hall, and Auditorium Exhibition Hall.

Meetings have been held with a committee of exhibitors who revised and approved rules and regulations for the 1950 Show. Every detail of the Show is developed for the best interests of the exhibitors, the visitors, and the Foundry Congress as a whole.

In assignment of space, according to A.F.S. Exhibit policy, equal consideration is given the small exhibitor as well as the large space occupier and effort is made to provide open views throughout the exhibit halls so that the display of any firm is not obscured by another nearby. Floor plans are kept flexible in order best to serve exhibitor requirements. Competition of souvenirs is discouraged and this year for the first time A.F.S. will provide large envelopes at the registration counters in which visitors may gather pertinent literature. Distribution of envelopes by exhibitors will be barred as in the past.

Great latitude is allowed all exhibitors, but objectionable loud speakers are not permitted, and unusual means of attracting attendance are considered on their merits and their contributions to the serious purpose of the event.

Wherever possible, technical meetings are held in the same building as the Foundry Show, and organized plant visitations are discouraged in order to retain maximum attendance in close proximity to exhibits and meetings throughout Convention Week.

Universal approval has been expressed over the A.F.S. policy of excluding the general public from Foundry Shows and confining attendance to registration of those definitely interested in the sessions, exhibits, or both. On one day, however, free admissions are provided for local plant men from 1:00 to 9:00 p.m., in the belief that these men will see equipment and products which they will refer to their supervisors for closer inspection later in the week.

Exhibitor Comments On Past Show

How well the A.F.S. Exhibit policies have been received by the exhibitors themselves may be gathered from the following, a few of the numerous favorable exhibitor comments on the manner in which the 1948 Foundry Show was conducted at Philadelphia:

One of the five large exhibit floors which will be used in the 1950 A.F.S. Annual Convention, Cleveland.

"The American Foundrymen's Society is to be complimented upon the manner in which the 1948 Foundry Congress and Show was handled. It was a pleasure to exhibit in such a show as compared to the usual treatment as far as labor and handling is concerned."

"We are pleased to report, from results of our display, we are not only enjoying a nice business ourselves, but from comments from those contacted since the Show, all agree the Show was well managed."

"Of primary importance was the caliber of attendance, which was extremely good. We secured a number of very interesting inquiries. The Show itself was run in very good order with proper aisle spacing and booth arrangement so that overcrowded conditions were not encountered."

"The management should be commended for the splendid success of this Convention—their cooperation, planning and efficiency eliminated the varied and many problems experienced by exhibits at other conventions."

"We were impressed by the serious interest shown by the members and very well satisfied with services rendered by the Society. We believe that the Show was a great success and you are to be congratulated on your achievements."

OXYGEN INJECTION APPLIED *in* STEEL FOUNDRY MELTING

G. E. Bellew
Steel Mill Specialist
Air Reduction Sales Co.
New York

THE USE OF OXYGEN in refining steel is rapidly becoming an established practice in the steel foundry. While the extensive investigation of the benefits of oxygen in producing ingots has been under way for several years, only in the past two years has the process been widely adopted by the steel foundries. This development has been particularly interesting, since it emphasizes the inherent benefits and flexibility of oxygen as a direct oxidizing agent.

While the substitution of gaseous oxygen for iron ore is a fundamental change in the method of refining steel, the equipment and techniques of oxygen injection are simple. The oxygen is supplied from a bulk installation (usually that serving the foundry cleaning room) and piped to the melting furnaces. Convenient outlets are supplied near the furnace working doors, and neoprene hose is used to connect the oxygen injection device to the outlet valve. A pressure gage is generally installed at the outlet, and the flow pressure of oxygen is used to control the rate of oxygen injection.

Injection Procedure

When oxygen is required for removing carbon, raising the bath temperature, or perhaps accelerating melting, the oxygen pipe or lance is inserted into the door or wicket hole, the oxygen flow started and the pipe immersed in the bath just below the slag line. The rate of carbon removal is controlled generally by time at a constant oxygen flow. The furnace helper, knowing the carbon drop rate in points per minute, merely keeps the oxygen pipe in the bath for a predetermined period. At the end of the injection period the heat is finished off in the usual manner.

Fundamentally, oxygen is more economical and beneficial in removing carbon and other oxidizable impurities than is ore refining because the oxygen gas is immediately available for reaction when it enters the steel bath, and the reaction of oxygen with elements in the bath produces heat. While it is beyond the scope of this discussion to consider fully the carbon-oxygen reaction in the steel bath, the use of oxygen as a direct oxidizing agent has emphasized certain factors which give a more certain control, if not understanding, of the process.

The work of Slottman and Lounsberry[1] provided a method for predicting the rate of carbon removal with oxygen, and also determined the efficiency of the oxygen-carbon reaction at various carbon levels. This work was done in a 90-ton basic open-hearth furnace. The aspect of this paper which is of particular interest in the present discussion is the conclusion that the rate of carbon removal in a given carbon range is a direct function of the rate of oxygen supply. Some indications were given that a very rapid rate of oxygen injection would improve efficiency. Subsequent data will be presented here in conjunction with operations of basic furnaces to confirm this point.

Other investigations published before extensive work with oxygen in foundries had started were mainly concerned with producing either low carbon steel, or alloy steels in ingot shops[2,3]. The benefits of oxygen were immediately apparent in shortening the time of carbon removal and, consequently, the over-all heat time; in conserving either fuel or power because of the shortened refining time and the exothermic reactions of oxygen with carbon, silicon and manganese; and in providing the furnace helpers with a ready means of raising the bath temperature. Because of mechanical and economical considerations, the standard practice evolved to where oxygen was used primarily in carbon ranges below 0.29 per cent.

Acid Electric Furnace Melting

Since the major tonnage in foundries is carbon steel, which is seldom refined to lower than 0.20 per cent carbon before blocking the heat, there was some question as to the practical application of oxygen in foundry open-hearth or electric furnaces. The small size of the melting units (as compared with the furnaces in ingot shops) meant fairly rapid heat times and generally large heat input factors so that refining reactions with ore were rapid. After a year and a half of extensive work, it has been established that oxygen has more universal application in foundry melting units than in ingot shops. This is true whether carbon or alloy castings are made, or whether acid or basic melting units are employed.

By utilizing the increased rate of carbon elimination and the bath temperature increase resulting from ox-

NOTE: This paper was presented at the Second Ohio Regional Foundry Conference, sponsored by the five Ohio Chapters of A.F.S. and by Ohio State University, held on the Ohio State campus, Mar. 11-12, 1949.

ygen injection, acid electric furnace operators have been able to show substantial savings in melting costs. This application of oxygen to foundry melting has been described by Wyman, Goehring and Faist[1].

Oxygen may be supplied from either bulk delivery units or cylinder manifolds. The rate at which oxygen is injected into the furnace is governed primarily by the carbon drop rate which the furnace operator desires. The carbon drop rate is generally five to seven points per minute, and the comparable oxygen rate to achieve this refining speed is 20 to 30 cu ft per ton per minute. Because of the relatively small size of the acid electric furnaces (2 to 10-ton charges), this oxygen rate can be readily maintained by the usual pressure reducing equipment.

It is interesting to note that a steel bath of the normal composition of a grade "B" steel charge can absorb oxygen at a rate of 100 cu ft per ton of steel per minute. Above this rate, part of the oxygen escapes without reacting, and in addition there is some danger of refractory damage. Fortunately, the practical rate of oxygen injection for good control of the refining reactions is well below the rate which decreases the chemical efficiency of the oxygen.

In order to determine predictable refining rates, it is necessary to establish the proper point in the refining cycle to introduce the oxygen. In the acid electric practice, oxygen is generally started after the bath is completely melted. The oxygen first reacts with silicon and manganese, until the bath temperature is high enough for the carbon reaction to start.

Rapid removal of carbon is indicated by voluminous flames coming out of the furnace door and around the electrodes. The power is turned off and the electrodes raised before oxygen is introduced. Where the furnace is a top-charge type, the roof is often raised slightly to provide a draft so that better visibility can be obtained through the working door of the furnace.

Since the amounts of manganese and silicon initially present in the bath and the temperature of the bath at the start of injection will affect the over-all rate of carbon elimination, these conditions should be constant from heat to heat. The composition of charge and degree of oxidation during the melting will have the greatest effect on the over-all rate of carbon removal at a constant oxygen flow. For example, several shops find that no oxygen is required on the first heat of the day, where the furnace has been charged at the end of the previous day and the charge has been in the furnace for 8 hr.

Oxygen is injected into the bath just under the slag-metal interface. Uncoated iron pipe may be used, and by moving the pipe laterally it can be kept slagged and pipe consumption minimized. The short period of oxygen injection and the size of acid furnaces make it possible to coat a short section of the pipe with either a plastic refractory or a core mixture, and the pipe coating materially reduces pipe consumption. The use of graphite tubes to inject oxygen in the bath has also been suggested.

When oxygen replaces ore in refining steel the same controls can be used. Slag-metal relations appear to be the same with ore as with oxygen. It has been found consistently in most acid shops that the residual manganese is higher in the bath when using oxygen than when using ore. This is due to the higher temperature of the bath during carbon removal. The quantity of oxygen required will depend primarily on the average carbon drop desired, and will vary from 50 to 100 cu ft per ton from shop to shop.

A typical oxygen injection operation on a steel foundry acid electric furnace. Carbon removal is indicated by flames at the furnace door and around the electrodes.

The use of oxygen shows definite savings in melting costs. Direct savings at the furnace have been given at $1.00 per ton based on decreased power and electrode consumption, and elimination of ore. In addition, the faster refining rate has increased the production rate and insured a vigorous boil in every heat, thus reducing the number of rejected castings. In general, it has been found that savings in power, ore and electrodes are greater than the cost of oxygen and equipment.

Table I illustrates the behavior of residual elements and gives the quantities of oxygen used. The chemical efficiencies indicate that additional oxygen is being transferred to the bath from the air during the oxygen injection, and that FeO liberated from the slag due to

the higher temperatures is also reacting with the bath[5].

Oxygen injection is an extremely valuable tool in refining acid open-hearth steel. Refining reactions are inherently slower in the open-hearth furnaces than in the electric furnaces, and oxygen injection provides a much faster means of eliminating carbon. In addition, the oxidation of the charge during melting is greater in the open-hearth furnace, so that the silicon and manganese contents of the bath when melted are low. Consequently, the quantity of oxygen required to eliminate a given amount of carbon is less for the open-hearth than for the acid electric furnaces.

Acid Open-Hearth Melting

The use of oxygen to raise the bath temperature of open-hearth furnaces and thus shape up the slag quickly has been applied to high-carbon heats as well as the medium-carbon heats. Appreciable time savings are thus realized in making all grades of steel, and furnace operators have greater flexibility in timing their heats to meet the requirements of the casting floor.

Carbon drop rates can be obtained with oxygen in the open-hearth furnace which are comparable to the refining rates of acid electric furnaces using oxygen. For example, a 20-ton acid open-hearth, scheduled to produce grade "B" steel, melted in at 0.52 carbon, 0.11 silicon and 0.04 manganese. Oxygen was injected into the bath for 6 min at 300 cu ft per minute, and at the end of the heat carbon was 0.22, silicon 0.04, and manganese 0.03 per cent. While this condition is unusual, it does illustrate the savings in heat time which can be realized by using oxygen injection.

TABLE I—DECARBURIZATION IN ACID ELECTRIC FURNACE HEATS—ELEMENTS AFFECTED

	C		Mn		Si		O_2	Efficiency,
Tons Chgd	Start	Finish	Start	Finish	Start	Finish	Cu ft	%
6	0.52	0.24	0.55	0.45	0.52	0.43	630	122
6	0.41	0.30	0.26	0.19	0.48	0.10	570	151
15	0.59	0.23	0.28	0.08	0.16	0.03	1800	125

A more usual practice with oxygen in acid open-hearth furnaces is to use the oxygen to make the final carbon adjustment before tapping. The bath temperature is raised and the heat quickly brought to the proper carbon level. In open-hearth shops it is generally the case that furnace scheduling is such that oxygen will only be beneficial on part of the heats. However, when used as a supplementary tool oxygen produces substantial economies.

Carbon can be eliminated at a rate of two to five points per minute, with oxygen requirement less than 3 cu ft per point ton. Thus, in open-hearth work, the average oxygen consumption per ton is in the range of 30 to 50 cu ft. In addition, the lower operating temperatures of the open-hearth furnace reduce the problem of pipe consumption. It is a simple matter to slag an uncoated pipe, and a standard length of pipe will last 15 to 20 min, or for five to seven heats.

Net savings in melting costs range from $0.50 to $1.30 per ton of metal when oxygen injection is used. These costs are based on savings of ore and labor, and do not take into account the shortened heat time and increased production. By having oxygen available at the open-hearth floor and injecting oxygen into the bath when a time saving will be realized, the furnace operators are able to keep the heat times constant.

Basic Electric Practice

Steel refining with oxygen in basic electric furnaces has been described for both carbon and alloy steel. While most of the applications in basic furnaces are for ingots, two points should be emphasized in conjunction with basic electric practice for foundries.

The first is the consistent carbon drop rate in refining carbon and low alloy steels. Although Slottman and Lounsberry[1] have suggested that an increased rate of oxygen injection would improve the efficiency of carbon elimination with oxygen, natural limitations in the oxygen flow rates encountered in working with large open-hearth furnaces make the maximum oxygen flow rate of the order of 10 cu ft per ton per minute.

In foundry practice, the size of basic electric furnaces (6 to 10-ton charges) permit oxygen flow rates for refining of 20 cu ft per ton per minute. In reducing carbon from 0.35 to 0.06 per cent with oxygen flowing at 20 cu ft per ton per minute, the carbon drop rate is consistent through the range at four points per minute. At low oxygen flows, the rate of carbon drop would decrease steadily below 0.15 per cent carbon.

The second important feature in using oxygen injection is the apparent lower hydrogen content when oxygen is used compared with the hydrogen content of the bath refined with ore. The work of Sims[7] showed that the elimination of hydrogen was a function of both the duration of the carbon boil (range of carbon eliminated while working the heat) and the speed of the boil. It was concluded that carbon drop rates in excess of 40 points per hour assist in lowering the dissolved hydrogen content of the metal bath.

Unfortunately, little data is available on the exact hydrogen content of steel baths in which oxygen injection has been used. However, experience in shops where oxygen has been used extensively indicates that defects attributed to excessive amounts of dissolved hydrogen—such as heats "backing up in molds"—have definitely decreased when oxygen is used[6]. Experience with acid furnaces indicates the same results in lowering hydrogen content of the furnace bath.

Basic Open-Hearth Furnaces

In addition to its use for rapid removal of carbon and increasing the bath temperature, oxygen injection is employed in basic open-hearth furnaces to speed melting and bring lime off the bottom. This latter application is particularly adapted to foundry operation because the furnaces are cold charged. Oxygen can be injected into the bath as soon as the heat is under cover and before it is completely melted without causing excessive splashing and agitation.

In order to direct the oxygen into portions of the bath containing unmelted material, the oxygen lance is moved from door to door. Oxygen requirements for this application will range from 50 to 150 cu ft per ton of metal. The main obstacle to this particular use of oxygen is the shortage of carbon-bearing raw materials for the original charge.

Oxygen is frequently used to heat a bath melting in soft, by adding pig iron and then blowing oxygen into

the bath. In all cases where oxygen is used to provide heat in the bath, the exothermic heat of oxidizing reactions is liberated at a point where the best heat transfer can take place—in the bath itself. In addition, the agitation from the carbon and/or lime boil permits more rapid heat transfer from the flame of the open-hearth furnace.

Melting Alloy Steels

Oxidation of carbon in the presence of chromium takes place more readily at elevated temperatures. The first commercial application of oxygen in refining steel was developed to permit the utilization of stainless steel scrap in producing stainless steel ingots[8]. Since the problem of reclaiming alloy foundry scrap is equally as critical, oxygen injection is now used in most shops producing high-alloy castings.

Recently, Hilty[9] determined the carbon-chromium-oxygen equilibrium, and gave quantitative data on the effect of chromium content and temperature in removing carbon from a bath containing high amounts (10-18 per cent) of chromium. By taking advantage of the exothermic reaction of oxygen with the high-alloy bath, the bath temperature can be quickly raised to levels which will enable the carbon to be reduced to stainless specifications without oxidizing large quantities of chromium from the bath.

Oxygen consumption in acid shops ranges from 400 to 650 cu ft per ton, depending upon the initial chromium in the melt and the final carbon desired. However, the savings in power, electrodes and labor are greater than the cost of the oxygen. In addition, foundries are able to recover valuable alloy constituents from the scrap.

In using oxygen for refining stainless heats, pressures range from 80 to 100 lb, corresponding to 50 to 60 cu ft per ton per minute. The high flows and pressures (in comparison with carbon steel) are necessary to attain high bath temperatures required to reduce the carbon. Temperatures above 3400 F are attained, but by rapidly finishing the heat refractory damage is kept to a minimum.

References

1. G. V. Slottman and F. B. Lounsberry, "The Use of Oxygen in the Open Hearth Practice for Carbon Reduction," *Yearbook*, American Iron & Steel Institute, 1947.
2. W. B. Amess, "Eliminating Carbon with Oxygen," *Steel*, vol. 122, p. 120, Feb. 2, 1948.
3. E. B. Hughes, "Direct Oxidation," *Open Hearth Proceedings*, vol. 30, p. 14, 1947.
4. Wyman, Goehring, and Faist, "Use of High Purity Oxygen for Decarbonization in Fire to Acid Electric Furnace," Preprint, Electric Furnace Steel Conference, Dec. 1948.
5. J. H. Berryman and J. M. Crockett, "Oxygen in the Electric Furnace," *Iron Age*, vol. 162, p. 72 Aug. 5, 1948.
6. J. H. Eisaman, "Use of Oxygen for Decarbonization and Melting in Electric Furnace," *Yearbook*, American Iron & Steel Institute, 1949.
7. Sims, Moore, and Williams, "A Quantitative Experimental Investigation of the Hydrogen and Nitrogen Control of Steel During Commercial Melting," *Metal Technology*, Feb., 1948.
8. U. S. Patent No. 2,226,967.
9. D. C. Hilty, "Relation Between Chromium and Carbon in the Refining of Chromium Steel," Preprint, Electric Furnace Steel Conference, 1949.

It's "Back to School" for these Metallurgy Professors

Teachers turned pupils for a three-day refresher course in sand techniques and applications at the Harry W. Dietert Co.'s September 7-9 Sand School session. Some 15 engineering school metallurgy and foundry instructors attended the Sand School, held at the Dietert plant in Detroit, under the sponsorship of the Foundry Educational Foundation. Pictured here are, left to right, Richard W. Heine, assistant professor, of Mining & Metallurgy, University of Wisconsin; George K. Dreher, executive director, Foundry Educational Foundation; C. T. Marek, assistant professor of Manufacturing Processes, Purdue University; Charles F. Walton, instructor in Metallurgy, Case Institute of Technology; F. S. Brewster, Harry W. Dietert Co.; Malcolm S. Burton, assistant professor of Metallurgy, Cornell University; Donald L. Crews, assistant professor of Metallurgy, University of Cincinnati; and Donald A. Bergh, Michigan State College.

FOUNDRYMEN OF 15 NATIONS met in Amsterdam, Netherlands, host city to the 1949 International Foundry Congress, held at the Royal Institute for the Indies, August 29, to September 2. Features of the five-day Congress were technical programs, visitations to foundries and metalworks in Amsterdam and nearby cities, excursions to points of interest, luncheons, teas, social events and a formal banquet climaxing the Congress.

Technical program of the Congress included presentation of papers in three languages on such topics as nodular iron, ferrous and non-ferrous metallurgy, heat transfer, materials handling in the foundry, cupola operation, pattern and coremaking, die casting, centrifugal casting, ferrous and non-ferrous melting practices, non-destructive testing, and many others.

Among special sessions of the 1949 Congress was a meeting of the International Committee of Foundry Technical Associations, made up of officials of the various national foundry organizations participating

A. W. Gregg, Consulting Engineer
Foundry Equipment Department
Whiting Corp.
Harvey, Ill.

International Foundry Congress delegates

1949 INTERNATIONAL

in the Congress. At its meeting the Committee elected Dr. Ing. F. Pisek of the Czechoslovak Foundrymen's Association president for 1950, and F. W. E. Spies, president of the Netherlands Technical Foundry Association, president for 1951. The Committee decided that there will be no International Foundry Congress in 1950, but that the 1951 Congress will be in Belgium.

350 Attend Congress

Officially opening the 1949 International Foundry Congress at the Royal Institute for the Indies on Monday morning, August 29, Mr. Spies welcomed some 350 attending foundrymen and their ladies in English. R. Deprez of Belgium, president of the International Committee of Foundry Technical Associations replied in French on behalf of the nations represented at the 1949 Congress. Dr. A. Winsemius, Director General for Industrialization of the Netherlands, welcomed delegates on behalf of his government, in a brief address. Other prominent Netherlands officials and industrialists present were Arn. J. d'Ailly, burgomaster of Amsterdam; T. J. Twinstra, president of the Dutch Federation of Industries; and C. P. van Eeghen, president of the Chamber of Commerce, North Holland province, the Netherlands.

Prof. Ir. D. Dresden, president of the Dutch National Council for Industrial Research, spoke at the opening meeting on educational and research programs now being carried out at the University of Delft, and told of the colorful history of the Dutch foundry industry. Dr. Dresden's historical summary served to provide a background for subsequent visitations to foundries in the Amsterdam area.

Following luncheon, at which the Netherlands Technical Foundry Association was host, technical sessions began at the Royal Institute for the Indies. Opening the program, which was divided into two sections running concurrently, were papers by T. P. Colclough, on *"Developments in Blast Furnace Efficiency,"* and by F. C. Evans on *"Foundry Melting Furnaces for Copper and Nickel Base Alloys."*

The official Paper of the American Foundrymen's Society to the 1949 International Foundry Congress opened the second Monday afternoon technical session. Presented by A. W. Gregg, Whiting Corp., Harvey, Ill., an official A.F.S. delegate to the Congress, the subject of the paper was *"Ferrous Melting Furnaces in the United States and Canada"* (Published in the October issue of AMERICAN FOUNDRYMAN, pages 27-32.) Given in a simultaneous session was a talk by L. J. G. van Ewijk on *"Magnesium Casting Alloys—Engineering and Foundry Properties."*

Concluding Monday's technical sessions were a paper by Marcel Ballay and Raymond Chavy on *"Twenty-Five Years' Evolution of the Foundry Industry,"* and one by A. Swagerman and H. Leutscher on *"Some Metallurgical and Practical Aspects of the Melting of Copper Alloys."*

Burgomaster Holds Reception

A reception given in the evening by the burgomaster of Amsterdam for visiting foundrymen and their ladies at the Amsterdam Municipal Art Gallery concluded Monday's activities.

Tuesday, August 30, was devoted entirely to foundry visitations in nearby cities, with a choice of two trips offered visitors. The first was to the Philips works at Eindhoven, and the second to the Werkspoor and the J. M. de Muinck Keizer foundries in Utrecht. The Werkspoor has a foundry for large castings and a

at Royal Institute of the Indies, Amsterdam.

visit was the progress made in repairing the extensive bomb damage done to the works during the war. In the evening, delegates made a bus trip to Haarlem, where they were shown through the museum. A soiree-dansant, held at the Apollo Pavilion, Amsterdam, concluded the day's activities.

On Thursday, September 1, the day's program was occupied by excursions to foundries and factories in nearby cities. Again, as on Tuesday, members were given an opportunity to take either of two tours—to Hengelo or to Ulft and Doesburg.

At Ulft, members visited the foundries of N. V. Diepenbrock & Reigers; at Doesburg, the Ubbink & Co. foundries; and at Hengelo, the Koninklijke Machinefabriek Gebr. Stork & Co., and N. V. G. Dikkers & Co. The Dikkers Co. makes iron, steel, and nonferrous castings, and Stork & Co. makes castings for diesel engines, sugar and textile machinery. Stork & Co.'s model workers' villages and recreational facilities are known throughout Europe.

Members of the International Committee were guests of F. W. E. Spies and Mrs. Spies at a dinner party Thursday evening.

Final technical sessions began Friday morning, Sep-

FOUNDRY CONGRESS

smaller, mechanized foundry for smaller castings. The Keizer foundry makes steel castings up to 30 tons.

Wednesday's program opened with technical sessions at the Royal Institute for the Indies. J. E. de Graaf delivered the first paper, *"A Special Case of Carbon Diffusion—From Cast Iron to Cast-In Steel,"* while in a simultaneous session J. S. Abcouwer spoke on *"Some Heat Transfer Problems Simplified."*

Tells of Nodular Iron Research

Dr. Albert L. De Sy of the University of Ghent, Belgium, spoke on *"Some Results of Belgian Nodular Graphite Research."* (EDITOR'S NOTE: Dr. De Sy's paper will appear soon in AMERICAN FOUNDRYMAN. One of the earliest works on nodular graphite research, *"Belgian Research Advances Nodular Graphite Theory,"* written by Dr. De Sy, appeared in the January, 1949, issue of AMERICAN FOUNDRYMAN.) Following this, J. Wozniacki spoke on the *"Correlation Between Different Hardness Numbers for Gray Cast Iron."*

"Experiments in Preheating Air in a 900 mm Cupola," was the subject of a paper by P. C. Maceraudi. This was followed by *"Influence of Oxygen, Nitrogen, and Carbon on the Impact Strength of Iron and Steel,"* presented by D. J. Fast.

Concluding the Wednesday morning sessions were *"A Special Die-Casting Method,"* by E. M. H. Lips, and *"The Temperature of Liquid Steel in Relation to Fluidity and Sand Burning-On for Steel Castings,"* by A. J. Zuithoff.

Wednesday noon, Congress visitors boarded a steamer for IJmuiden, where the Royal Dutch Iron and Steelworks' sand-spun pipe foundry, coke ovens, and blast furnaces were visited. An interesting feature of this

tember 2, with R. Grimault speaking on *"Sand Preparation Equipment,"* and J. H. Manders and H. R. Bruce on *"Materials Handling in Jobbing Foundries."*

In the second session, M. Stap spoke on *"Standardization of Molding Sand Testing."* *"Car Engine Piston Rings Cast Centrifugally in Sleeve-Form,"* was the subject of a paper given by P. Januszewicz. L. Petrzela spoke during the third session on *"Studies in Sand Preparation."* D. J. da Silva and J. J. Verziji delivered a paper on *"Modern Foundry Methods."*

Concluding the technical program for the 1949 International Foundry Congress were papers by J. G. P. Bruschke—*"Manufacture of Ingot Molds in Cement Sand"*; J. V. Yperen—*"The Manufacture of Metal Patterns and Coreboxes Without Machining by the Clay-Plaster Method"*; and by L. van Ouwerkerk on *"Non-Destructive Testing of Castings."*

Following the last technical session on Friday was a motor launch trip through the canals and harbor of Amsterdam. Returning from the trip in the early afternoon, delegates witnessed a Javanese dancing performance and motion picture, followed by a tea at the Royal Institute for the Indies.

Final Banquet Concludes Congress

Concluding the 1949 International Foundry Congress was a banquet held at the Minerva Restaurant on the outskirts of Amsterdam. During the entire five days of the Congress, a concurrent Ladies' Entertainment program featured excursions to museums, flower auctions, the Hague Peace Palace, famous old castles, and other points of interest.

Both A.F.S. delegates to the Congress—the author and Vincent Delport, Penton Publishing Co.'s European manager—were particularly impressed by the

friendly, cooperative attitude of our hosts, the Dutch people, who treated us as guests of the nation and figuratively handed us the "key to the city." It might be mentioned here that about 80 per cent of the Dutch we met spoke English well.

Official delegates of the eight participating national foundry technical organizations to the 1949 International Foundry Congress were:

American Foundrymen's Society—Vincent Delport and A. W. Gregg; *Belgian Foundry Technical Association*—R. Deprez and E. Commins; *French Foundry Technical Association*—Marcel Ballay and A. Brizon; *Institute of British Foundrymen*—V. C. Faulkner and D. H. Wood; *Italian Foundrymen's Association*—Mario Olivo and A. Palmucci; *Polish Foundrymen's Association*—C. Kalata and G. Kniaginin; *Czechoslovak Foundrymen's Association*—F. Pisek and A. M. Plesinger; and *Netherlands Technical Foundry Association*—F. W. E. Spies and R. Reitsema. Also present in an official capacity was Tom Makemson of the Institute of British Foundrymen, secretary of the International Committee of Foundry Technical Associations.

Delegates pictured during a visitation to foundries of the Werkspoor and J. M. de Muinck Keizer companies at Utrecht, the Netherlands, part of an extensive plant visitations program of the 1949 Congress.

British Columbia, Ontario Chapters Expand Foundry Education Programs

EXPANDED EDUCATIONAL PROGRAMS for 1949-50 are already in progress at two A.F.S. Canadian chapters—British Columbia and Ontario. Each Chapter is conducting courses consisting of several lectures on various phases of gray iron, steel, malleable and non-ferrous foundry work, given by prominent local foundrymen.

British Columbia Chapter's 1949-50 Educational Course, featuring a series of seven talks on *"Structures and Properties of Cast Metals,"* began October 12 and will continue through November. Meetings are held each Wednesday evening at the Vancouver Vocational Institute. Fees for the entire course are: Members, $3; Non-members, $5; Apprentices, no charge.

The seven weeks' course was arranged by the British Columbia Chapter's Educational Committee, headed by Prof. W. M. Armstrong of the University of British Columbia.

The Educational Program of the A.F.S. Ontario Chapter has been greatly expanded this year to include a series of lectures on foundry subjects given together with concurrent Monday night courses in molding at the Hamilton Technical School, Hamilton, Ont., and a second series given at the Western Technical School, Toronto. In addition, the Chapter has instigated day courses in foundry at the Western Technical School.

Other activities of the Ontario Chapter include maintenance of a foundry film service and work on a survey of foundry industry within the Chapter. Reginald H. Williams, Canadian Westinghouse Co. Ltd., is Director of Education for the Chapter.

The Chapter's Hamilton Technical School course is given Thursday evenings, October 6 through March 30, under Presiding Instructor W. Jones, Canadian Westinghouse Co., Ltd., and has a concurrent course in molding, given Monday evenings, starting October 10, under the direction of T. Hewitt, Canadian Westinghouse, Ltd. The fee for the entire course is $5.

November 17, 24–December 1—*"Cupola Operation,"* Norman Bennett, Canadian General Electric Co., Ltd.

December 8, 15—*"Iron Metallurgy and Control,"* Benton Dixon, Dominion Wheel & Foundries, Ltd.

January 5, 12, 19—*"Gates and Risers,"* John Hughes, John T. Hepburn Ltd.

January 26–February 2, 9—*"Non-Ferrous Metallurgy,"* F. B. Diana, Z. Wagman & Son, Ltd.

February 16, 23–March 2—*"Patterns,"* T. Myatt, Toronto Pattern Works.

March 9, 16, 23, 30—*"Casting Defects,"* Maurice Holland, General Smelting Co. of Canada, Ltd.

Started on October 3, the Chapter's series of lectures given at the Western Technical School, Toronto, is held Monday evenings under Course Instructor A. Pirrie, Gurney Foundry Co., Ltd.

November 21, 28–December 5—*"Cupola Operations and Control,"* Norman Bennett, Canadian General Electric Co., Ltd.

January 9, 16, 23—*"Gates and Risers,"* John Hughes, John T. Hepburn Co., Ltd.

January 30–February 6, 13—*"Patterns,"* T. Myatt, Toronto Pattern Works.

February 20, 27—*"Non-Ferrous Metallurgy,"* Morris Davison, Canada Metal Co.

March 13, 20, 27—*"Casting Defects,"* N. Nesbitt, Grinnell Co.

MICHIGAN REGIONAL CONFERENCE SETS NEW ATTENDANCE RECORD

HIGHEST ATTENDANCE since the conferences at Michigan State College were started was registered at this year's Michigan Regional Foundry Conference at East Lansing October 28 and 29. Sponsored by four Michigan chapters of A.F.S. and the Mechanical Engineering Department of the college, the conference had as a theme *"New Developments in the Foundry Industry."* Most of the 225 registrants attended each session because only one meeting was held at a time.

The keynote speaker, L. A. Danse, General Motors Corp., Detroit, set the pace for disclosure of new developments and conference attendants were not disappointed as they heard talks on mechanization, progress in research, stress analysis, effect of sand on metal shrinkage, and nodular iron.

Cites Regional Meeting Value

L. C. Price, head of the Department of Mechanical Engineering at Michigan State, opened the conference by citing the gradual drawing together of the science and art of founding and said that meetings like the A.F.S. regional foundry conferences helped draw them closer. Presiding at the sessions the morning of October 28 was C. H. Jacobson, Dake Engine Co., Grand Haven, Mich.

Mr. Danse said that development of foundry equipment has not kept pace with mechanical developments in other fields. Someday, he predicted, mold making will be fully automatic and will start with placing of the flask and end with a completed mold section coming out of a fully automatic machine. Equipment people are working on this now, he added.

Other predictions of Mr. Danse included universal use of a closed-top cupola which uses 15 per cent less of a lower grade coke and eliminates air pollution.

Discusses Foundry Mechanization

Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., discussed mechanizing for production of small and large castings in widely varying lot sizes. He described the 10 molding units of the Caterpillar foundry and told how a number of jobs are interchangeable and can be moved from one unit to another depending on the need. On huge V-12 diesel engine castings an electric alarm system on each mold avoids wasting iron by indicating when to stop pouring.

Pattern changes are made in a few minutes on slinger units by changing an entire molding machine. New patterns are mounted on spare machines which are substituted on the turntable when a change is desired. Other units used slingers, jolt-squeeze, jolt-roll-over, jolt-strip, and other molding machines, giving a high degree of versatility to the molding department.

Caterpillar makes 1½ lb of cores for every pound of castings shipped, according to Mr. Shipley. Where possible core boxes for blowing are interchangeable; 85 per cent of the small core boxes are blown.

Walter Gerlinger, Engineering Service, Inc., Milwaukee, presented a discussion in which he distinguished between mechanization and modernization. Too often, he said, the foundryman thinks of an elaborate installation when a small investment will enable him to make the best possible use of his facilities.

Thomas F. Butler, Ford Motor Co., Dearborn, Mich., discussed mechanization from a maintenance standpoint. Equipment must be rugged, he said, and the layout must provide ready accessibility for oiling, inspection, and so repairs can be made rapidly.

Mechanization with reference to costs was discussed by Walter Hummel, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. who said it is necessary to determine the actual savings and other values expected from mechanizing before installation.

National President E. W. Horlebein spoke on *"Activities of the American Foundrymen's Society"* at the luncheon meeting. Outlining the tangibles and intangibles of Society membership, he discussed the organization's research and technical committee program and pointed to the fellowship prevalent at regional conferences and chapter meetings.

New A.F.S. Student Chapter Forming

Austen J. Smith, Michigan State College, presiding at the luncheon, announced the formation of a student foundry group which has petitioned the A.F.S. Board for recognition as the eighth student chapter of the Society. He introduced the secretary-treasurer of the new group, Donald I. Huizenga, one of the students being helped by the Western Michigan Chapter's Donald J. Campbell Educational Fund.

Fitz Coghlin, Jr., Albion Malleable Iron Co., Albion, Mich., presided at the first afternoon session. First speaker was H. L. Womochel, Michigan State College, who described four current foundry research projects being conducted at the school and stated a number of tentative conclusions. One study has demonstrated that calcium-silicon is superior to ferrosilicon and that the calcium rather than the silicon is the most potent factor in inoculation. Calcium alone can be used, said Prof. Womochel.

In a study of heredity in induction melted cast iron four types of charges with the same final analyses showed definite variations in properties. Effect of oxidation in induction melting, a third study, showed higher losses of silicon, carbon, and manganese in the oxidized heats but the decrease in properties was so small as to be almost within experimental error.

An attempt to determine the mode of formation of graphite nodules was being made by quenching nodulized iron in water. Quenched liquid iron showed no nodules, but partly solidified metal showed eutectic metal solidifying around nodules, he said.

In his paper on cupola smoke control, W. N. Witheridge, General Motors Corp., Detroit, said there is great need for standards for measuring air pollution. Optical density of stack emission is too often taken

Entrance to campus of Michigan State College.

as a measure of severity of air pollution, he said, whereas it may represent only a very small proportion of the air pollution of the area. Greatest current problem is to remove heavy particulate matter, he indicated, outlining and illustrating various baffle and water barrier systems which have been devised.

Thaddeus Giszczak, working on the A.F.S. Cupola Research Project, said he found no uniformity in air pollution ordnances and recommended that foundrymen familiarize themselves with local requirements.

The late afternoon session featured discussions on stress analysis by William T. Bean, consultant, Detroit, and Frank Tatnall, Baldwin Locomotive Works, Philadelphia. Presiding was V. A. Crosby, Climax Molybdenum Co., Detroit. Mr. Bean urged foundrymen to invest in the future of their industry by engineering their castings. He said that evaluation of materials was the first step.

Mr. Bean declared that design based on true properties of the metal in the casting was the next step. Evaluation of loads is the third step, the speaker said.

Discusses Casting Design Developments

Mr. Tatnall said that modern theory of design calls for making a structure stronger by making it lighter instead of beefing it up. Design must be based on facts not assumptions, he said, and he explained the use of brittle lacquer and strain gages in the practical development of casting design.

Principal speaker at the conference banquet Friday night was Talbert Abrams, Abrams Aerial Survey Corp., Lansing, Mich. Charles C. Sigerfoos, Mechanical Engineering Dept., Michigan State College, presiding, read a telegram from Michigan Governor G. Mennen Williams wishing success to the conference.

Saturday morning was devoted to discussions of nodular iron and the effect of mold materials on metal shrinkage. Lyle L. Clark, Buick Motor Div., G.M.C., Flint, Mich., presided throughout the morning. At the first session Harold Austin of Buick and Clyde A. Sanders, American Colloid Co., Chicago, presented two different points of view on influence of the mold on metal shrinkage. Mr. Austin said he believes any influence the sand has is related to its expansion-contraction behavior. Mr. Sanders believed density and heat transfer were the significant factors.

Mr. Austin insisted that the metal is seldom at fault in case of shrinks and draws although the degree of shrinkage is influenced by the carbon equivalent.

Mr. Sanders declared that shrinkage is greater if heat conductivity and mold density are low.

Prof. Sigerfoos, during the discussion, recalled the work he and Prof. Womochel reported in "*Influence of the Mold on Shrinkage in Ferrous Castings*," TRANSACTIONS, A.F.S., vol. 48, pp. 591-622 (1940).

Prof. Womochel showed slides from the paper to indicate that high moisture, high green strength, soft ramming, and unfavorable grain distribution tend to promote shrinkage.

Reviews Nodular Iron Properties

D. E. Krause, Gray Iron Research Institute, Columbus, Ohio, principal speaker at the nodular iron session, reviewed the properties and production of this new material, pointing out that one of its outstanding properties is its high ratio of yield strength to tensile strength.

Choice of melting equipment is dictated by production costs, Mr. Krause declared. Apparently no limit exists to the amount of iron which can be treated at one time. Magnesium recovery decreases as temperature of molten metal treated increases, but the effect of the treatment does not wear off if residual magnesium is above about 0.06 per cent, he said.

Describes Experiences With Nodular Iron

Robert B. Melmoth presented a short paper describing nodular iron experience of Ford Motor Co., Dearborn, Mich. He said that liquid shrinkage was similar to malleable iron but varies with composition. Pattern maker's shrinkage is the same as gray iron. A skin of high toughness makes liquid nodular iron difficult to run through strainer cores and gives the metal the appearance of low fluidity, but once the metal gets into the mold it will run fins and needles, the speaker declared.

Mr. Melmoth said the properties of nodular iron are not seriously affected by section size and pointed out the need for more service data and comprehensive information on properties.

Charles C. Sigerfoos, Michigan State College, general conference chairman, was assisted by the following members of the Conference Planning Committee: Walter F. Bohm, Buick Motor Div., G.M.C., Flint, Mich.; Frank S. Brewster, Harry W. Dietert Co., Detroit; Marshall V. Chamberlin, Dow Chemical Co., Bay City, Mich.; Stanley H. Davis, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; Walter Kantzler, Kelsey-Hayes Wheel Co., Detroit; R. J. Kleis, Leonard L. Price, and Austen J. Smith, and Howard L. Womochel, all of Michigan State College; and Ross P. Schaffer, Lakey Foundry & Machine Co., Muskegon.

PLANNED FOUNDRY DUST CONTROL

Theodore F. Hatch
Research Director
Industrial Hygiene Foundation of America
Pittsburgh

BUILDING HEALTHFUL WORKING CONDITIONS into the foundry involves more than good engineering design and proper installation of a particular system of ventilation. Responsibility cannot be turned over to the engineers and the problem forgotten. The technical details are properly left to the engineers, but management must be concerned with broader problems—with the limitations, as well as the effectiveness, of specific control measures; how the layout and construction of the foundry itself affects the problem; how the selection of processes and equipment aggravate or minimize the difficulties. Relative costs and returns and, above all, the human side of the problem must receive consideration.

Certain basic engineering matters must be considered and decisions made before it is time to consider design details of particular control devices. Although of an engineering nature, these are more the responsibility of management than of the engineer. Simply stated, building healthful working conditions into the foundry starts with consideration of the structure itself, the selection of production equipment, and layout of operations.

Requirements for dust control as well as for production must enter into the initial planning, design and selection of equipment. When the design of accessory control equipment is carried out as a secondary undertaking, the work is made more difficult and costly, and the design is often handicapped with limitations which could have been avoided by joint consideration of the requirements for dust control as well as for production before selecting production equipment or deciding upon plant layout.

Building Size vs. Activity

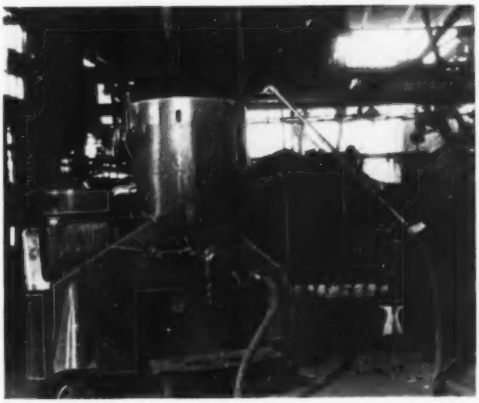
The foundry with generous floor area and high ceiling enjoys a fundamental advantage with respect to working conditions over the crowded foundry with low roof, poor lighting, and limited ventilation. In a study of the foundry dust problem some years ago, the findings roughly suggested that the desirable minimum is a building volume of about 2000 cu ft, or a floor area of around 75 sq ft, per man-ton of daily capacity. For example, with 50 men and 10 tons daily production, the floor area should be at least 37,000 sq ft. With 25-ft ceiling height, this would give a building volume of approximately 2000 cu ft per man-ton per day.

Satisfactory dust control was observed in foundries with greater crowding, but the effort required to secure good working conditions was correspondingly greater. The advantage gained by adequate space is a basic and continuous one, not dependent upon maintenance as is the case with ventilation and other measures of improvement in the form of added equipment. The money spent to gain greater work space constitutes a more fundamental investment. It provides greater assurance that the desired returns will be secured from funds spent for control devices, such as ventilation.

Basic advantage with respect to dust control and working conditions is also gained by proper layout of the foundry in relation to the important dust sources. Most valuable is the effective separation of the relatively clean operations from those which are inherently dirty and more hazardous. For example, molding and coremaking are not major dust-producing operations and, by themselves, are not considered hazardous.

Clearly, the cleaning department should be physically separated from the molding area, and coremaking similarly separated from the rest of the foundry. Since core ovens require considerable ventilation, the coreroom should have its own air supply from outside. Layout to insure orderly flow of materials through the plant, with ample storage area for flasks, patterns, etc. when not in use, is essential to good housekeeping.

General ventilation is depended upon for removal of fumes and smoke and even for dust control during manual shakeout operations. Extensive installations of roof ventilators of the gravity or mechanical type are common. These rather expensive installations frequently fail to perform their expected functions because provisions were not made for admitting air into the plant to make up for that exhausted through the roof, or to insure its distribution within the plant.



Regular removal of accumulated dust is part of safety and good housekeeping program at Muskegon, Mich., plant of Campbell, Wyant & Cannon Foundry Co.

Also, the extra heat load imposed by the air exchange is not always considered in calculating the needed capacity of the heating plant. The result is that the ventilating system is shut down in cold weather and returns from the investment for general ventilation are lost. In these cases, false economy rather than complete engineering analysis has dictated the design. If full benefit is to be derived from general ventilation, the design-

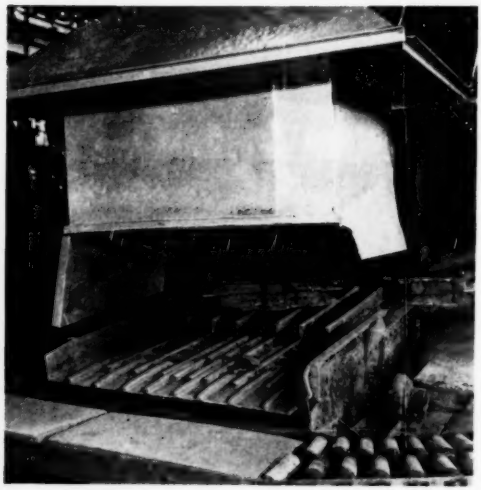
NOTE: This paper was presented at the Gray Iron Founders' Society annual meeting, Atlantic City, N. J., Oct. 11, 1948.

ing engineer requires the full support of management to make certain that the complete system is installed.

Mechanization of foundry operations accounts for much of the improvement in working conditions in recent years. Sources of dust and fume are concentrated in a few well-defined spots so that enclosures and effective ventilation can be applied. In the manually operated foundry, the sources of contamination are scattered and local ventilation is not applicable.

It is important to remember, however, that with mechanization the quantity of dust and fume released is greater than with manual operations. Mechanization may aggravate rather than minimize the dust problem unless it is accompanied by the essential enclosures and ventilation for dust and fume control.

In the initial planning for layout of the mechanized foundry and in the selection of equipment, the requirements for these enclosures and for exhaust hoods must



Dust control at the source is illustrated by the suction hood installed at a shakeout station of the Campbell, Wyant & Cannon Foundry Co. plant, Muskegon, Mich.

receive the same attention as those for production. For example, the manner in which flasks are transferred to the shakeout grate and the casting removed determines the degree of enclosure which is permitted on the shakeout. Failure to take this into consideration at the outset has made it necessary in certain cases to accept a poor compromise in hood design, with unsatisfactory removal of dust and fumes as a consequence.

Mechanization greatly increases plant capacity per unit of floor area and, as a consequence of the greater activity, the dust control problem is made more acute. Since the costs involved in mechanization are great, certainly dust control, for which mechanical equipment is being installed, must be assured from the outset. To protect the primary investment in mechanization, additional funds may be required for the greater floor area which is needed to offset the increased activity.

In the cleaning room, where the greatest silicosis risk apparently exists, much has been accomplished by the introduction of new methods such as enclosed cleaning mills and rooms and the use of wet operations. The greater dust hazard here, compared with the risk in other departments, comes from the fact that the dried sand grains adhering to the casting are crushed to fine dust and actively dispersed into the air by chipping and grinding operations. Thus, the free silica content of the dust is considerably higher than at the shakeout, for example, when the fine dust contains considerable clay and iron oxide.

Core Knockout Dust Reduced

The removal of complex cores and the sand coating on dirty castings before chipping and grinding, by high pressure water blast or comparable means, not only reduces the amount of dust released in these final operations but, of greater significance, it largely eliminates silica exposure. Grinding with a synthetic abrasive wheel on clean metal involves no silica exposure.

With the new types of equipment now available, the foundry cleaning department can be changed from the most hazardous to one of the cleanest and safest areas in the plant. Exhaust ventilation is needed on grinders and other dust-producing operations, but this is secondary to the basic improvement provided by changes in cleaning processes.

Foundry equipment manufacturers have contributed greatly to the improvement of working conditions in the modern plant. Several new processes have been developed with the primary objective of reducing dust contamination. Other pieces of mechanical equipment, however, are inherently dust producers and, in some cases, the application of exhaust ventilation is made needlessly difficult because of the design of the apparatus or its method of operation.

In selecting equipment among alternate designs, the relative problems of dust control should receive consideration along with comparative functional characteristics. Equipment manufacturers should consider the problem of dust control in initial designs and developments and assume responsibility for satisfactory performance in this regard, just as they do for mechanical performance.

For a number of industrial dusts, rather good quantitative relations have been established between the amount of dust in the air and the incidence of silicosis. These relationships show that when the dust concentrations are kept below certain tolerable levels, there is little risk of contracting the disease over the normal working span. Thus, for granite dust, the permissible dust concentration is said to be 10 million particles per cubic foot of air. For dusts of higher free silica content, a maximum concentration of 5 million is generally recommended.

Foundry Dust Studies Needed

Systematic studies of sufficient magnitude have not been made in the foundry industry to establish the comparable level for foundry dust. A confusing factor, in this connection, is the influence of iron oxide in the chest x-ray picture. It is capable of producing x-ray changes like those of silicosis, although it apparently does not cause disability nor pathological changes in the lungs. This effect, however, does seriously limit

the value of the chest x-ray as a diagnostic tool in the medical control program of foundries, and it certainly confuses the picture in respect to the relationship between the silicosis hazard and the magnitude of dust exposure.

In the practical problem of dust and fume control, the wisest procedure is to make every practical effort to reduce exposure to the iron oxide fume as well as to silica dust. Otherwise, there will always be a question as to the effectiveness of the silicosis control program because of the uncertain meaning of x-ray changes which may be observed.

It is expected that current investigations in representative foundries by the United States Public Health Service will provide the needed data for establishing the levels of tolerable dustiness in this industry. In the meantime, an average concentration of 10 to 15 million particles per cubic foot of air can certainly be used as a reasonable guide, although it should be considered only as a temporary index. Practically, it has merit because actual foundry experience has shown that it is attainable.

Periodic measurements of dust concentration provide one useful measure in the appraisal of working conditions. Owing to the varied nature of foundry operations and the wide range in dust levels which occur normally throughout the day, it is not a simple matter to obtain meaningful results. A considerable number of samples and careful selection of locations and time of sampling in relation to cycles and sequence of operations are required. Such periodic surveys of dust concentration should, therefore, be accompanied by more frequent visual inspection with systematic recording of practical observations.

A.F.S. 1949 *TRANSACTIONS* ARE NOW AVAILABLE

MAILING of the 1949 annual TRANSACTIONS of A.F.S., Vol. 57, starts the middle of November. Containing a record of the business transactions of the Society and the papers and discussions presented at the 1949 Annual A.F.S. Convention in St. Louis, the huge volume of nearly 700 pages reports also the progress on the various Society-sponsored research projects and includes the exchange papers to and from the foundrymen of England, France, and Australia.

Contents of this year's TRANSACTIONS cover the entire field of foundry practice and technology and report many new ideas and new applications of old principles. The condensed table of contents below shows the range of interest and value of Vol. 57, 1949 annual TRANSACTIONS, to the foundry industry:

"Steel Castings in Welded Assemblies"
"Properties of Cast Iron in Relation to the Carbon Equivalent"
"Problems in Bronze Foundry Practice"
"Graphitization of Gray Cast Iron By Heat Treatment"
"Risering Castings"
"A Study of the Principles of Gating"
"9th Annual Report—Properties of Steel Sands at Elevated Temperatures"
"Comparative Solidification Studies"
"Blast Humidity as a Factor in Cupola Operation"
"Metallography of Cast Magnesium Alloys"
"Fast Analysis of Acid Slags"
"Graphite Resistor Furnace Melting Practice"
"Design and Operation of a 10-in. Diameter Cupola"
"Effects of Temperature and Silicon Content on First Stage Annealing of Black-heart Malleable Iron"
"Modern Foundry Core and Mold Ovens"
"Recent Developments in Theory and Practice of Insulating Sleeves, Pads, and Risers for Non-ferrous Casting"
"Sand Properties vs. pH"
"Effect of Slag Types on Heat Treatment of Malleable Iron"
"Graphitizing Behavior of White Iron"
"Effects of Various Deoxidizers on the Structures of Sulphide Inclusions"
"Metallography of Aluminum Casting Alloys"
"Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze"
"Mechanized Foundry Maintenance"
"Effect of Aluminum and Vanadium on Toughness of High Hardenability Cast Steels"
"Attracting and Keeping Good Men in the Foundry"
"Developing Standard Data Tables for a Four-Man Molding Unit"
"Fluxing of Aluminum Alloys"
"Heat Transfer . . . A Foundryman's Tool"
"Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron"
"Study of Insulating and Mildly Exothermic Antipiping Compounds Used for Steel Castings"
"Production and Consumption of Heat in a Cupola"
"Metal Melting and Its Relation to Gases in Metal"
"Plastic Binders for Foundry Sand Practice"
"Surface Hardening of Pearlitic Malleable Irons"
"Magnesium Castings Designed for Aircraft Engines"
"Report of the A.F.S. Cupola Research Committee"
"Study of the Workable Green Strength of Core Mixtures"
"New Method for Determining Austenitic Grain Size of Cast Steel"
"Scabbing Tendencies of Molding Sands"
"Design Light Metal Castings"
"Approach to Standard Costs in the Foundry"
"Melt Quality and Fracture Characteristics of 85-5-5-5 Brass"
"Prevention of Hot Tears in Thick-walled Centrifugally Cast Steel Tubes"
"Information Needed to Produce Satisfactory Pattern Equipment"
"Growth and Scaling Characteristics of High-Silicon Cast Iron"
"Effect of Boron on Structure and Some Physical Properties of Plain Cast Irons"
"Correlation of Cooling Curve Data with Casting Characteristics of Aluminum Alloys"
"Influence of Rate of Heating on First Stage Graphitization of White Cast Iron"
"Grain Refining of Aluminum Alloys and Its Effect on Physical Properties"
"Casting Surface Finish"
"Causes of Rat-Tail Casting Defects"
"Effect of Composition on Properties and Structure of Cast Monel"
"Maintenance of Wood and Metal Patterns"
"Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black-Heart Malleable Iron"
"Gas-Fired Melting of Copper-Base Alloys in a Reducing Atmosphere"
"Controlled Atmosphere Annealing of Malleable Iron"
"Industrial Hygiene in the Foundry"
"Symposium on Nodular Graphite Cast Iron"
"Note on As-Cast Structure and Grain Size in Cast Alloy Steels"
"Problem of Gases in the Indirect-Arc Furnace"
"Centrifugal Casting of Aluminum Alloys"

Prepublication orders based on requests received prior to printing are being filled now. Additional orders are being accepted at the member price of $8.00 (prepublication member price was $6.00) and the non-member price of $15.00. The limited edition was based primarily on orders received and paid for in advance of publication. Orders for the 1949 TRANSACTIONS should be sent to American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill. Postage will be prepaid if remittance accompanies order.

EASTERN CANADA CHAPTER'S SHERBROOKE MEETING STRESSES GATING AND RISERING

A. J. Moore
District Manager
Montreal Bronze, Ltd.
Montreal, Que., Canada

COMBINING TECHNOLOGY AND RECREATION, Eastern Canada Chapter's two-day meeting, held at the New Sherbrooke Hotel, Sherbrooke, Que., September 30-Octobef 1 was attended by 165 foundrymen.

The technical program featured sessions on latest gating and risering techniques, patternmaking, and molding sands, while the recreational program, held Saturday afternoon, October 1, following conclusion of technical activities, included golf, baseball, impromptu football games and other sports at the North Hatley Country Club, Sherbrooke. Other highlights of the meeting were visitations to foundries in the area, two luncheons, a fellowship hour sponsored by local foundry supply houses, and a dinner meeting.

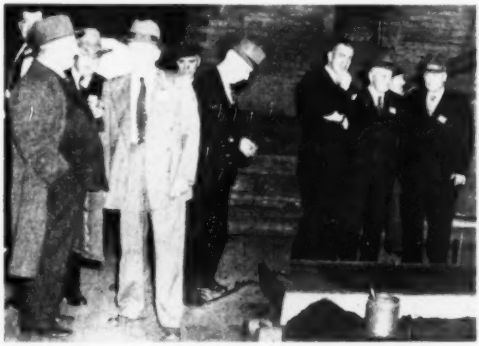
The entire technical program of the opening day, September 30, was devoted to *"Gates and Risers,"* with separate sessions for Steel, Bronze and Iron.

Discussion leader for the Iron group on *"Gates and Risers"* was G. Turnbull of Shawinigan Foundries, Ltd., Shawinigan Falls Que., who digressed somewhat from the general subject by concentrating on the subject of costs in iron foundries. Customers, Mr. Turnbull said, are now asking that castings be produced at a lower cost. This can be accomplished, the speaker said, by iron foundries making greater use of their personnel, either through installation of improved equipment or through better management techniques. Mr. Turnbull's paper provoked an interesting discussion of the subject following its presentation.

A.F.S. National Director A. N. Delahunt, Warden-King, Ltd., Montreal, acted as Iron Group leader.

W. Bennett, Dominion Engineering Works, Ltd., Lachine, Que., discussion leader for the Bronze Group, presented an informative, comprehensive paper on *"Gates and Risers in Brass and Bronze,"* dealing with high-shrinkage and heavy dross forming alloys. Mr. Bennett used slides to illustrate methods of gating and risering various shapes and sizes of castings, and answered numerous inquiries on the subject from the floor following presentation of his paper. J. G. Dick, Canadian Bronze Co., Ltd., Montreal, acted as technical chairman for the Bronze Group session.

The Steel Group's discussion had as its leader W. Turney Shute, Canadian Car & Foundry Co., Ltd., Turcot, Que., who like Mr. Turnbull deviated some-



Canadian visitors looking over a molding floor during a visitation to area foundries at the Sherbrooke meet.

Some Canadian foundry notables seated at the speakers table at the Sherbrooke meeting banquet, September 1, were, left to right, John Hunt, Dominion Engineering Works, Ltd., Montreal, Eastern Canada Chapter secretary; George Beaton, Dominion Steel & Coal Corp., Sidney, N. S.; A.F.S. National Director E. N. Delahunt, Warden King, Ltd., Montreal; G. W. Young, Canadian Ingersoll-Rand Co., Ltd., Sherbrooke; Mayor Trudeau of Sherbrooke; Eastern Canada Chapter Chairman James H. Newman, Newman Foundry Supply, Ltd., Montreal; and A. J. Moore, Montreal Bronze, Ltd., meeting general chairman.

what from the general topic of gating and risering. Mr. Shute pointed out that the only way in which the steel casting industry can prevent penetration of the forgings and castings industries into its domain is by producing castings of the very highest quality. As an adjunct to the obtaining of good quality in steel castings it is essential that good gating and risering practices be followed, Mr. Shute concluded. Technical Chairman C. Hacker, Lynn MacLeod Metallurgy, Ltd., Thetford Mines, Que., presided over the discussion.

Following Friday's technical sessions, Canadian foundry equipment and supply manufacturers were hosts to the group at a get-together hour held in the

A foursome "holing out" at the North Hatley Country Club, following the last technical sessions of the two-day Sherbrooke meeting on Saturday, October 1.

Canadian Room of the New Sherbrooke Hotel immediately preceding the dinner meeting.

Opening the technical program on Saturday morning, October 1, were talks by Norman Bradley, Canadian Ingersoll-Rand Co., Ltd., Sherbrooke and Alex Watson, Canadian National Railways, Montreal, on *"A Patternmaker in the Foundry."*

Urge Foundry-Pattern Shop Cooperation

Both Mr. Bradley and Mr. Watson stressed the importance of cooperation between the patternmaker and the foundryman in the production of high quality castings. In the discussion that followed, it was evident that the talks had been both interesting and informative. In this particular meeting, both patternmakers and foundrymen were encouraged to express themselves freely on the subject.

Concluding technical session of the two-day meeting featured a paper on *"Scabbing Tendencies in Molding Sand,"* presented by Henry Louette, Warden-King Co., Ltd., Montreal.

Following a buffet luncheon, some 46 members who attended the meeting remained to participate in golf, baseball, touch football and other sports at the North Hatley Country Club.

General Chairman of the Sherbrooke meeting was A. J. Moore, Montreal Bronze, Ltd., Montreal, with M. A. Hughes, LaSalle Coke Co., Montreal, as vice-chairman and Eastern Canada Chapter Chairman James H. Newman, Newman Foundry Supply Co., Ltd., Montreal, acting in an advisory capacity.

Sherbrooke meeting committee chairman and members are as follows:

Entertainment: Chairman, W. C. Rowe, Crane, Ltd., Montreal; C. Singleton, Manganese Steel Castings, Ltd., Sherbrooke; Wm. Davis, Union Screen Plate Co. of Canada, Ltd., Lennoxville, Que.; D. Winslow, Canadian Ingersoll-Rand Co., Ltd., Sherbrooke; and Leonard Desautels, Superheater Co., Ltd., Sherbrooke.

Reception and Registration: Chairman, Dudley Coates, Canadian Ingersoll-Rand Co., Ltd., Sherbrooke; D. Winslow, Canadian Ingersoll-Rand Co., Ltd.; W. J. Brown, Robert W. Bartram, Ltd., Montreal; P. B. Savoie, Webster & Sons, Ltd., Montreal; C. Bourassa, Werner G. Smith Co., Ltd., Montreal; and Wm. Davis, Union Screen Plate Co. of Canada, Ltd., Lennoxville.

Housing: Chairman, M. A. Hughes, LaSalle Coke Co., Ltd., Montreal; W. C. Rowe, Crane Co., Ltd., Montreal; R. Whiting, La Salle Coke Co., Ltd., and M. E. Fee, Canada Starch Sales Co., Ltd., Montreal.

Outing: Chairman, C. H. Atkinson, Geo. F. Pettinos (Can.), Ltd., Montreal; C. Singleton, Manganese Steel Castings, Ltd., Sherbrooke; E. Patton, E. Galvin and L. MacEntush, all of Canadian Unitcast Steel, Ltd., Sherbrooke; and N. Chartier of Superheater Co., Ltd., Sherbrooke.

Others active in organization of the Sherbrooke meeting were Lucien Guilmette, Canadian Foundry Supplies and Equipment, Ltd., Montreal, vice-chairman of the Eastern Canada Chapter; Russell Neville, Manganese Steel Castings, Ltd., Sherbrooke; and C. E. Bassett, Canadian Fairbanks Morse Co., Ltd.

Awards Board To Use New Manual

THE A.F.S. BOARD OF AWARDS will meet December 8 under the chairmanship of Past President (1942-43) Duncan P. Forbes, Gunite Foundries Corp., Rockford, Ill., to select recipients of A.F.S. Gold Medals and Honorary Life Memberships to be presented at the Society's Annual Convention and Foundry Show, May 8-12, 1950, in Cleveland. In use during the meeting for the first time will be the new MANUAL OF ESTABLISHED POLICIES AND PRACTICES OF THE BOARD OF AWARDS adopted January 1949.

The manual covers procedures governing the selection of individuals to be recognized by the American Foundrymen's Society for noteworthy service rendered and contributions made on behalf of the castings industry. The pamphlet has been distributed to Board of Awards members, National Officers and Directors, and chairmen of the A.F.S. Divisions.

The Board of Awards consists of the last seven living Past Presidents of the Society with the senior Past President as chairman. In addition to Chairman Forbes, Board members are: Lee C. Wilson, Reading, Pa.; Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.; F. J. Walls, International Nickel Co., Detroit; S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; and W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh.

HOW FEF POLICIES AFFECT { Students / Universities / Industry

George K. Dreher
Executive Director
Foundry Educational Foundation
Cleveland

LENGTHY AND SPECIFIC RULES and regulations for the Foundry Educational Foundation and the cooperating schools would hamstring the progress of the industry within the universities. They have been avoided studiously. Instead, FEF has sought the guidance of the educational institutions in the realization of our purposes. Their suggestions, coupled with the practical needs of the foundry industry, have become the basis for the broad policies set up as a background for the second Foundry Educational Foundation cycle, to begin in May 1950.*

Objectives of the Foundry Educational Foundation as set forth in its Articles of Incorporation provide a basis for development of present FEF policies. The objectives are:

1. To foster and improve education in the United States in the field of foundry engineering, practice, and operation among colleges and universities.

2. To encourage and assist students in acquiring education and training in foundry engineering, practice and operation.

3. To develop adequate instruction to carry out these purposes.

Broad Student Assistance Program Offered

Encouragement and assistance to students goes far beyond financial aid. A scholarship program broad enough to permit awards for the total number of students we seek (300 entering the industry per year by 1958) would run into fantastic costs. For this reason, the Foundry Educational Foundation encourages other students to elect voluntarily the foundry option with the understanding that the Foundation will extend to them every courtesy accorded the more fortunate scholarship holders. These voluntary students will be presented to the industry and treated in the same manner as the scholarship students.

Others who graduate from regular engineering courses will find the Foundation cooperative. The regular students, however, generally will not have the industrial foundry experience which the scholarship and voluntary students have achieved through summer work and foundry lecture and laboratory courses.

Universities are much more inclined to grant scholarships to applicants who have spent all their undergraduate years in that school rather than to transfer students from other universities although some transfer students have received FEF scholarships. Applicants must comply with the requirements of their school as to method of selection and amount to be granted. Scholarship amounts will vary within the school and it is anticipated that need will be a factor in the assignment.

The student must be a full citizen of the United States at the time of the award and must have matriculated in the university. Beyond this, the university has final authority and responsibility for the selection of scholarship holders.

Scholarship Requirements

Generally, scholarships are to be granted qualified upper class engineering students who have no commitments or understandings which will prevent them becoming foundrymen and who sincerely contemplate the foundry industry as their career upon graduation. The Foundation recommends that prior experience or summer foundry work be a factor in scholarship selection. Scholarship or voluntary students are to consult with their advisors as to foundry subjects and supplementary work. This will include preparation of a thesis on a foundry subject if required.

FEF advocates that the funds it provides for scholarships be limited to upperclassman although some exceptions may occur. The greatest student mortality occurs in the first two years. By the time third-year standing is achieved, the ability and character of the student begins to crystallize and the scholarship has more meaning to him. While graduate students may be awarded scholarships under this program, the Foundation recommends that such awards be limited in number, as the program is primarily for undergraduates.

Align Scholarships With Industry Needs

Universities are urged to select candidates for the Foundation scholarships in line with the needs of the industry. For the moment, these needs are interpreted in the order of greater opportunity as follows:

Supervisory and managerial staff—mechanical, industrial, metallurgical, and business administration graduates.

Sales engineers—mechanical, industrial, metallurgical, electrical, chemical, petroleum and civil engineering graduates.

Metallurgical engineers—metallurgical graduates.

Industrial engineers—industrial engineers, business, and engineering administration graduates.

Plant engineers—mechanical and electrical engineering graduates.

Business and engineering administration—business and engineering administration, management, etc.

Character and personality traits to assist in this

* Fund solicitation for the second three-year cycle now under way started in October (AMERICAN FOUNDRYMAN, September, 1949, page 29).

selection will be identified through a summary of such data as is available and by discussion with members of the foundry industry. FEF will seek the assistance of the university staff in guiding registration of voluntary and regular engineering students to help insure greater acceptability by the industry.

Acceptance of an FEF scholarship carries the obligation to work in a qualified foundry while the scholarship is active on cooperative or summer work or as required by the university except through specific arrangements. In case of need, the Foundation will attempt to place the student in a qualified plant. FEF scholarship holders are required to register with the Foundation. Voluntary students selecting the foundry option are urged and invited to do the same. Registration is the basis of contact for summer jobs and permanent positions in the industry.

Through its executive director, the Foundation hopes to follow the progress of each scholarship

Robert Barteaux, production line superintendent, Ferro Foundry & Machine Co., Cleveland, recently graduated from Pennsylvania State College, one of five schools that recently joined the Foundation program.

student. It is felt that acquaintance with the students will make it possible to guide them into the industry to advantage, and thus give them the best opportunity to insure their personal success, to be a credit to their university, and to benefit the industry.

The Foundation will confine its placement activities to under-graduates, seniors, and graduate students as far as contact and employment in industry is concerned. The Foundation will not engage in re-employment practices. Many young engineers who have been out in industry for some time have sought our aid in obtaining other positions during the past two years. FEF is not to function as an employment agency for the industry. Its efforts and activity are solely with students or graduate students.

Once employment has been effected the Foundation cannot again offer such help. To do so would open the FEF to adverse criticism by present employers and would confuse its functions. Other avenues for positions are open to a graduate once he is in the industry. His acquaintance with other plants will grow fast thus opening the way for personal contact. Foundry industry and other metals magazines maintain a fee service* for personal notices. The founding members of FEF—American Foundrymen's Society, Gray Iron Founders' Society, Malleable Founders' Society, Steel Founders' Society, Foundry Equipment Manufacturers Association, and Non-Ferrous Founders' Society—are actively interested in the placement of young engineers with some degree of experience.

Plan Long-Range Program

While the initial goal of FEF is one graduate each year for every 1,000 employees in the industry at the end of the first ten years, the trustees feel that some form of program, or contact arrangement will continue indefinitely. The long range objective is to have all foundry lectures and laboratory work in direct control of an associate or higher ranking professor assisted by technicians and instructors. This will assure the engineering approach to foundry problems . . . foundry studies then will be definitely at an engineering level.

As in any business, the head of the plant passes final judgment upon major additions or changes. In the universities the dean of the engineering college is the man whose final approval is required. In most cases approval is based on the recommendation of a department head. For this reason FEF prefers to work with the department head under whose jurisdiction the foundry lecture and laboratory classes are conducted. Thus Foundation activity in the university channels through one individual. This should not be interpreted as restricting the program to any one department as there is need for a variety of engineers to handle the manifold activities of the foundry.

Key FEF School Departments Listed

In the FEF schools the key departments are: MIT department of metallurgy; Cornell school of chemical & metallurgical engineering; Case, department of metallurgy; Cincinnati, school of chemical & metallurgical engineering. Northwestern, department of mechanical engineering (industrial engineering option); Wisconsin, department of mining & metallurgy; Penn State, department of industrial engineering; Ohio State, department of industrial engineering; Purdue, department of general engineering; Missouri School of Mines, department of metallurgy; Michigan State, department of mechanical engineering.

The Foundation believes that all students in every engineering college should have a part or full semester course in foundry technology during which the essential operations can be disclosed and attention given to the abilities required to operate an engineering foundry. This same course should reveal the general usage of castings and the factors which control the cost of the final part as cast and finished for assembly into a structure.

Students preparing for the supervisory, technical, sales, and managerial opportunities in the industry

* See Page 91 of this issue.

should take a sequence of foundry lectures and laboratory work in the final year. These courses should seek to exercise the basic engineering which the student has studied up to this point along the lines of foundry operations, problems, and potential. Several other standard engineering courses will help in preparing for a foundry career. These include metallurgical calculations, ferrous and non-ferrous metallurgy, and engineering economy. Each student preparing for the castings industry—whether he is in mechanical, industrial, electrical, chemical, petroleum, civil, ceramic or management engineering—should have a sequence of two or three metallurgical courses prior to his foundry study. Metallurgy is the common denominator of all foundry engineering and influences its every step.

Desirable Basic Courses Cited

Other regular courses desirable as basic education for industrial duties include business or contract law, economics, cost accounting, methods engineering, quality control, production control, industrial relations, and industrial management. Many others could be added but a few courses in the humanities will complete a desirable group. These include English, history, and an advanced course in psychology to initiate the prospective graduate into the mysteries of human motivation and emotion. Available courses in marketing, sales engineering, and purchasing are desirable for students anticipating a sales career.

The Foundation will seek the help of the university in selecting an advisory committee for each school. It will be the function of this committee to represent the industry at the university and to help keep foundrymen of the area informed on activities at the school.

Funds Available to Universities

FEF funds can be used by the university for scholarships, to support adequate instruction, and to help defray expenses incurred in the operation of the foundry laboratory. The funds are not to be used for capital equipment. Funds assigned to the university for scholarships and other purposes shall be paid to the properly designated officer for current use and are to be administered through the university.

Universities Cooperate With FEF

The Foundation is prepared to assist the universities in refinement of present courses and development of new ones which will better serve the industry and the students. The willingness of universities to cooperate has been evident in their desire to take advantage of the facilities and information provided by and through the Foundation. It is understood, however, that the universities are final authority on the exact content and presentation of course material.

The Foundation believes that distribution of company literature to universities and students will spread information and enhance respect for the foundry industry. Distribution of such data, though, is fraught with misunderstanding and the possible brand of favoritism. For this reason the Foundation will not engage in the distribution of specific company literature. It will, on occasion, reproduce technical articles for distribution to students and universities where these will benefit the Foundation's program. Company literature can be distributed by the individual firms or through the various societies of the industry. Current listings of professors and university staff members connected with the foundry program will be maintained in the bulletins and literature of the Foundry Educational Foundation.

Interest Engineers In Foundry

FEF is devoted wholly to increasing knowledge of and an interest in foundry products and processes in all student engineers and in opening the door of opportunity to those who show an especial interest. No one kind of engineer can satisfy the full needs of the industry, so it is impossible to conceive of such a degree as foundry engineer. The engineers who will enter the industry are trained in fundamentals in such a manner as to pick up additional knowledge in a minimum of time. Through summer work and foundry laboratory courses the various engineers become interested in and familiar with the foundry industry, its markets and its methods.

Specific benefits and usage of engineering talent is a subject for future discussion and revelation. The talent is being appreciated and the engineering ability is being applied in an increasing number of plants. The extent of this will be the true measure of the foundry industry's engineering educational effort.

Chapter Fetes A.F.S. President

Sixty fellow members of the A.F.S. Chesapeake Chapter met October 10 at the Hotel Stafford, Baltimore, to hold a "Presidential Party" in honor of A.F.S. National President Edwin W. Horlebein. Each foundryman present was called upon to make a few, brief remarks, and A.F.S. Past National President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., proffered a few humorous words of advice gleaned from his own experiences as National President in 1948. The evening was climaxed by presentation of a piece of leather luggage to President Horlebein, who assured the membership that it would be put to good use in his visits to A.F.S. Chapters throughout the country. Pictured in the photograph are Mr. Horlebein (left) and Chapter Vice-Chairman A. A. Hochrein, Federated Metals Div., American Smelting & Refining Co., Baltimore, who headed the party's arrangements committee.

CHOOSE NOMINATING COMMITTEE MEMBERS

W. B. Wallis

Max Kuniansky

B. A. Miller

W. A. Hallberg

Henry Louette

J. A. Durr

C. N. Wilcox

NOMINATING COMMITTEE MEMBERS who will select a slate of officers and directors to head the American Foundrymen's Society in 1950-51 were announced at the first meeting of the 1949-50 Board, July 29. Chosen by the Executive Committee as prescribed by the By-Laws are:

Past President (1948-49) W. B. Wallis, president, Pittsburgh Lectromelt Furnace Co., Pittsburgh—*Chairman.*

Past President (1947-48) Max Kuniansky, vice-president and general manager, Lynchburg Foundry Co., Lynchburg, Va.

J. A. Durr, formerly of Albion, Mich.—representing Central Michigan Chapter, foundry services, and malleable iron.

W. A. Hallberg, foundry engineer, Lakey Foundry & Machine Co., Muskegon, Mich.—representing Western Michigan Chapter and gray iron.

Henry Louette, assistant superintendent, Warden King, Ltd., Montreal, Que., Canada—representing Eastern Canada Chapter and gray iron.

B. A. Miller, superintendent of foundries, Baldwin Locomotive Works, Philadelphia—representing Philadelphia Chapter and brass and bronze.

Martin J. O'Brien, Jr., works manager, Symington-Gould Corp., Buffalo, N. Y.—representing Western New York Chapter and steel.

H. S. Simpson, chairman of the board, National Engineering Co., Chicago—representing Chicago Chapter and foundry equipment.

C. Neal Wilcox, assistant foundry superintendent, Electric Steel Foundry Co., Portland, Ore.—representing Oregon Chapter and steel.

The Nominating Committee was chosen in accordance with Article 10, Section 2, of the By-Laws which

H. S. Simpson

M. J. O'Brien, Jr.

states: *On or before October 1 of each year the Executive Committee of the Board of Directors shall appoint a Nominating Committee of seven members, six of whom shall be from the list of eligible candidates submitted by the various chapters, and one of whom may be from the list of members residing outside chapter territories, who, together with the last two living presidents, shall constitute a Nominating Committee.*

In appointing the Nominating Committee the Executive Committee shall elect members thereof in such a manner as to provide equitable, regional representation, and shall consider proportional representation for the several branches or divisions of the membership.

The 1950-51 Nominating Committee was selected from candidates proposed by chapters not represented on the Committee during the past two years. The names of two candidates were submitted by such chapters to the president of A.F.S. prior to July 1.

The Nominating Committee is required by the By-Laws to meet at least 90 days prior to the Annual Business Meeting and the names of the nominees selected by the Committee must be published in AMERICAN FOUNDRYMAN at least 60 days before the Annual Business Meeting held at the A.F.S. Convention.

COMPLETE NEW YORK STATE REGIONAL PLANS

FINAL PROGRAM PLANS for the New York State Regional Foundry Conference, to be held this year for the first time, have been completed. The Conference, which will be held on the Engineering and Science campus of Syracuse University, Syracuse, N. Y., is sponsored by the A.F.S. Central New York, Eastern New York, Rochester and Western New York Chapters and by the University's College of Applied Science.

NEW YORK STATE REGIONAL

Highlights of the two-day New York State Regional Foundry Conference will be six technical sessions, a demonstration of nodular iron vs. untreated iron, two luncheons, a Conference dinner, and a visitation to Syracuse University laboratories.

Friday, November 25

9:00 a.m.—REGISTRATION. Main Engineering Bldg.

9:15 a.m.—Demonstration of "*Nodular Iron vs. Untreated Iron*," Drs. B. J. Lazan, F. R. Morrall and the staff of the Materials Engineering Dept., Syracuse University.

10:30 a.m.—OPENING SESSION. Opening of Conference by E. E. Hook, Dayton Oil Co., Syracuse, General Conference Chairman. Host Chapter Welcome by Central New York Chapter Chairman J. F. Livingston, Crouse-Hinds Co., Syracuse. University Welcome by F. Gordon Smith, executive secretary, Syracuse University.

10:45 a.m.—GENERAL SESSION.
"*Latest Developments in Nodular Iron*," J. C. H. Stearns, Jr., Dow Chemical Co., Midland, Mich.

1:00 p.m.—LUNCHEON. Speaker, Dr. R. E. Montonna, director, Institute of Industrial Research, Syracuse University.

2:30 p.m.—MALLEABLE IRON SESSION.
"*When to Use and Advantages of Malleable Iron*," James H. Lansing, Malleable Founders' Society, Cleveland.

1:00 p.m.—NON-FERROUS SESSION.
Speaker, B. A. Miller, Baldwin Locomotive Co., Philadelphia.

4:00 p.m.—STEEL SESSION.
"*General Foundry Practice*," William Ball, R. Lavin & Sons, Inc., Chicago.

7:00 p.m.—CONFERENCE DINNER. Ball Room, Onondaga Hotel, Syracuse. Speaker, Dr. T. V. Smith, Syracuse University.

Saturday, November 26

9:00 a.m.—REGISTRATION. Main Engineering Bldg.

9:30 a.m.—SAND SESSION.
Speaker, Harry W. Dietert, Harry W. Dietert Co., Detroit.

11:00 a.m.—MOTION STUDY SESSION.
Speaker, Prof. B. H. Norem, College of Applied Sciences, Syracuse University.

1:00 p.m. LUNCHEON.
"*Training Foundry Engineers*," Prof. Peter E. Kyle, Cornell University, Ithaca, N. Y.

2:15 p.m.—LABORATORY VISITATION. Materials Engineering Bldgs. Administrative Engineering, Chemical Engineering and Industrial Design Depts.

Regional Conference officers are: *general chairman*, E. E. Hook, Dayton Oil Co., Syracuse; *secretary*, J. F. Livingston, Crouse-Hinds Co., Syracuse; and *treasurer*, W. D. Dunn, Oberdorfer Foundries, Syracuse.

A.F.S. National Director L. D. Wright, U. S. Radiator Corp., Geneva, N. Y., is chairman of the Program Committee, with Martin J. O'Brien, Jr., Symington Gould Corp., Depew, N. Y., as co-chairman. Committee members are Kenneth Proud, Anstice Corp., Rochester, and Jasper Wheeler, Wheeler Brass & Aluminum Foundry, Troy, N. Y.

Chairman of the Arrangements Committee is E. G. White, Crouse-Hinds Co., Syracuse. Members are Bruce Artz, Pangborn Corp.; J. O. Ochsner, Crouse-Hinds Co., and Frank C. Wheeler, Kinman & Wheeler, all of Syracuse.

Publicity Committee chairman is John A. Feola, Crouse-Hinds Co., Syracuse. Members are F. E. Bates, Worthington Pump Corp., Buffalo; Leon C. Kimpal, Rochester Gas & Electric Co.; and John M. Jones, American Locomotive Co., Schenectady.

Syracuse University faculty members participating in the Conference are Drs. R. E. Montonna, B. J. Lazan, and F. R. Morral, Dean Louis Mitchell, Prof. E. Syrene and S. B. Schaffner.

The New York State Regional Foundry Conference is the sixth regional meeting to be held this year. Yet to come are the Ohio Regional Foundry Conference, to be held March 10-11, 1950, in Cincinnati and sponsored by the A.F.S. Canton District, Central Ohio, Cincinnati District, Northeastern Ohio and Toledo Chapters; the Birmingham Regional Foundry Conference, to be held in Birmingham, Ala., February 2-4, 1950, by the A.F.S. Birmingham District Chapter; and the Wisconsin Regional Foundry Conference, to be held in Milwaukee February 9-10, 1950.

Patent Magnesium-Bearing Cast Iron

TWO PATENTS on cast ferrous materials containing magnesium have been announced by International Nickel Co., New York. U. S. Patent No. 2,485,760, entitled "Cast Ferrous Alloy," has 17 claims relating to iron containing graphite in the nodular or spheroidal form; No. 2,485,761, "Gray Cast Iron Having Improved Properties," covers magnesium-bearing gray iron with flakes in compacted form.

COLORIMETRIC DETERMINATION OF ALUMINUM IN MANGANESE BRONZES

J. Carroll, I. Geld, and G. Norwitz
Material Laboratory
New York Naval Shipyard
Brooklyn, N. Y.

A rapid and convenient method for the determination of aluminum in manganese bronzes employs the addition of aluminon to an aliquot of the electrolyte obtained after separating the copper and lead by electrodeposition. The combined color due to the iron and aluminum is then developed. A correction is then made for the iron. The composite aluminon reagent of Craft and Makepeace* is used in the color development. Straight-line curves were obtained for both the aluminum and iron. Colors were found to be additive.

Apparatus and Reagents

Klett-Summerson photoelectric colorimeter with 540-millimicron filter and 4-cm cell.

Benzoic Acid Solution (10 per cent): Dissolve 50 grams of benzoic acid in 500 ml of methanol.

Buffer Solution: Mix 470 ml of ammonium hydroxide (29 per cent) and 430 ml of glacial acetic acid. Cool to room temperature and add more acid or base as necessary to adjust the pH from 5.25 to 5.35 when diluted 1 to 20. Dilute to 1 liter.

Gelatin Solution (1 per cent): Dissolve 3 grams of gelatin by adding hot water and stirring. Cool and dilute to 300 ml.

Aluminon Reagent: Dissolve 0.3 grams of high purity aluminon in 200 ml of water and add 60 ml of benzoic acid solution (10 per cent). Dilute to 300 ml. Add 300 ml of buffer solution and 300 ml of gelatin solution and shake. The aluminon reagent should stand 3 days before using. The reagent was found to be stable for at least 2 months if stored in the dark.

Procedure

Remove tin, copper and lead as in standard procedures by dissolving a 1-gram sample in nitric acid, filtering off the tin as metastannic acid and electrolyzing the copper and lead. After the electrolysis, dilute the electrolyte to exactly 250 ml and pipette a 25-ml aliquot (for manganese bronzes containing over 1.7 per cent aluminum use a smaller aliquot) into a 200-ml volumetric flask. Dilute to 200 ml with water and pipette a 5-ml aliquot into a 100-ml volumetric flask.

Develop the color as in the method for steels.* Read from a chart or curve the percentage of aluminum represented by the combined aluminum and iron colors, and make a correction for the iron present in the electrolyte. The authors found the iron color to be 0.366 times as intense as the aluminum color.

The reference curve for aluminum percentages is made by the use of standard aluminum solution. To prepare this standard aluminum solution dissolve 0.400 grams of high-purity aluminum in a mixture of 10 ml of nitric acid (70 per cent), 5 ml of hydrochloric acid (38 per cent), and 15 ml of water, and then dilute to 1 liter.

The curve from which the correction factor for iron is determined is made by the use of standard iron solution. To prepare this standard iron solution dissolve 0.400 gram of high-purity iron in 20 ml of nitric acid (1 to 1) and dilute to 1 liter.

Table I shows the results obtained when two representative manganese bronzes were run several times each for aluminum determinations.

The authors wish to thank W. L. Miller for his helpful suggestions.

TABLE I—ALUMINUM DETERMINATIONS ON MANGANESE BRONZES

Sample	Al Present, %	Al Found, %
62b[1]	0.97[3]	0.97
		0.97
		0.97
		0.95
		0.95
		0.99
		0.97
10A2[2]	0.25[4]	0.26
		0.25
		0.26
		0.24
		0.23

[1] Contains 0.82% Fe.
[2] Contains 1.21% Fe.
[3] National Bureau of Standards certified value.
[4] Determined by mercury cathode-gravimetric method, 5-gram sample.

Future Meetings and Exhibits

NEW YORK STATE REGIONAL FOUNDRY CONFERENCE, A.F.S. Upstate New York Chapters, Syracuse University, Syracuse, N. Y.—Nov. 25-26.

CHEMICAL INDUSTRIES, exposition, Grand Central Palace, New York—Nov. 28-Dec. 3.

SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, annual meeting, Hotel New Yorker, New York—Nov. 30-Dec. 2.

MALLEABLE FOUNDERS' SOCIETY, western sectional meeting, Drake Hotel, Chicago—Dec. 9.

BIRMINGHAM REGIONAL FOUNDRY CONFERENCE, A.F.S. Birmingham District Chapter, Tutwiler Hotel, Birmingham, Ala.—Feb. 2-4, 1950.

WISCONSIN REGIONAL FOUNDRY CONFERENCE, A.F.S. Wisconsin Chapter, Schroeder Hotel, Milwaukee—Feb. 9-10, 1950.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual committee week, William Penn Hotel, Pittsburgh—Feb. 27-Mar. 3, 1950.

OHIO REGIONAL FOUNDRY CONFERENCE, A.F.S. Cincinnati District, Canton District, Northeastern Ohio, Central Ohio and Toledo Chapters, Netherlands Plaza Hotel, Cincinnati—Mar. 10-11, 1950.

STEEL FOUNDERS' SOCIETY OF AMERICA, annual meeting, Edgewater Beach Hotel, Chicago—Mar. 21-22, 1950.

AMERICAN SOCIETY OF TOOL ENGINEERS, Philadelphia—Apr. 10-14, 1950.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12, 1950.

*C. H. Craft and G. R. Makepeace, *Industrial Engineering Chemistry*, Anal. Ed., 17, 260 (1945).

NOTE: The opinions expressed in this article are those of the authors and are not to be construed as representing the official views of the Navy Department.

What's in a Name?

THE PROBLEM OF NAMING the new material which in the as-cast condition contains graphite in a nodular or spheroidal form was outlined a month ago in AMERICAN FOUNDRYMAN. We published the opinions of a number of foundrymen and metallurgists and include herewith additional ideas of workers in the field. Other communications will appear on the Letters to the Editor page as they are received.

Henceforth, where no other descriptive terminology is provided, AMERICAN FOUNDRYMAN will use the term *nodular iron* or *nodular graphite cast iron* for this new material.

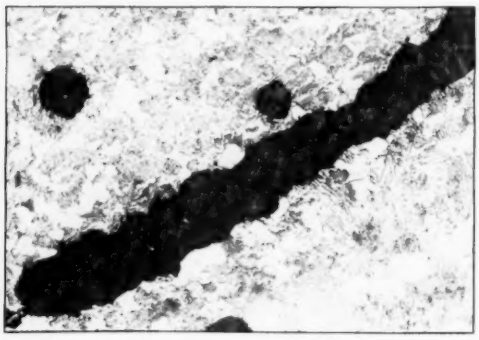
—*Editor.*

The terms "nodular graphite cast irons" or "nodular irons" have been applied to describe cast irons having nodular graphite structures in the as-cast state. Whether these terms are scientifically correct may be questioned, but a large number of metallurgists and foundrymen now understand what they mean. This must be borne in mind if considerations of terminology lead to changes in nomenclature.

It is important that others—engineers, designers, users—should understand the terms adopted. In this extrametallurgical field, terms referring to the properties of the material are frequently best appreciated. Unfortunately, nodular irons are not all characterized by any one property likely to define the material for a user.

Fig. 9 (left)—Elongated graphite spherulite in a nickel-carbon alloy treated with strontium-magnesium. Unetched. X1500.

Fig. 10 (below)—Elongated graphite spherulite in a sample of whiteheart malleable iron having sulphur present as FeS. Etched, 4 per cent picral. X150.



Nodular irons may be ductile or relatively nonductile; hard or relatively soft; magnetic or nonmagnetic; heat-resisting or not particularly heat-resisting; etc. In fact, all the physical and chemical properties of the material can vary between quite widely placed extremes. What, then, are the specific characteristics of nodular irons? They are the metallographic characteristics, coupled with the method of manufacture. They all should possess at least part of their graphite in the form of nodules in the as-cast state.

According to the dictionary, the term "nodular" means: having the form of, or occurring in nodules; and a "nodule" is defined as: a small rounded lump of some mineral. In this sense the term 'nodules' has been used quite satisfactorily to describe the graphite which characterizes malleable cast irons and much of the graphite in the newer materials. More specifically, the nodular graphite in malleable cast irons has been referred to as "temper carbon nodules." This implies, quite correctly, that the nodular graphite structures are produced by heat treatment. Strictly speaking, most of the conventional malleable cast irons are also nodular cast irons, although we believe they are never referred to as such.

Graphite Forms in Malleable Iron

In malleable cast irons we have distinguished two forms of nodular graphite. The one form, which occurs when the sulphur present in the iron is in the form of manganese sulphide, we have termed "graphite flake aggregate temper carbon nodules." This nodular structure consists of an aggregate of small, apparently randomly oriented graphite particles. This structure is typical of American or blackheart malleable iron.

Another form of temper carbon nodule can occur, the spherulitic form, when the sulphur in the iron is predominantly in the form of iron sulphide. The spherulitic form of nodule has in the past been confined almost entirely to European whiteheart malleable cast iron, but this spherulitic structure is also that which characterizes the as-cast nodular cast irons.

It is important that the nature of the spherulitic structure be thoroughly understood. Considerable misuse

of this term has occurred in the literature. "Spherulitic" is not synonymous with "spheroidal." Spherulites may have any shapes. It so happens that the spherulites of graphite in cast iron are usually approximately spheroidal in outline, but not always so. Each spherulite consists of a number of graphite crystallites radiating from a common center, the basal planes of each graphite crystallite being oriented so that they are approximately at right-angles to the radii of the spheroid of which the spherulite can be considered to be composed.

The important point about the term "spherulite" is that it refers to a specific arrangement of graphite crystallites inside each nodule. Instances of extreme departure from the spheroidal outline are shown in Figs. 9 and 10. Figure 9 shows an elongated graphite spherulite in a nickel-carbon alloy treated with a strontium-magnesium alloy, and Fig. 10 shows a similar structure in a sample of high sulphur whiteheart malleable cast iron.

Considering some of the terms which might be ap-

H. Morrogh D. E. Krause

plied to the material, the following objections can be listed:

1. Spherulitic Cast Iron: This does not distinguish as-cast nodular cast irons and high sulphur European whiteheart malleable cast iron.

2. The term "nodular" does not differentiate, strictly speaking, the as-cast materials from the whole range of malleable cast irons.

3. "Spheroidal" does not differentiate as-cast materials from many malleable irons, and it is undesirably more specific than "nodular."

Although the terms "nodular cast iron," "nodular graphite cast iron" or "as-cast nodular cast iron" are somewhat vague in themselves, it does appear that metallurgists understand them to refer to the new material; in fact, in Great Britain it appears that "nodular cast iron" is quite adequate to convey the meaning. This being the case, we would favor the acceptance of the term "nodular iron" or "nodular cast iron" to define the new product when all or a substantial part of the graphitic carbon is in the form of spherulitic nodules in the as-cast condition.

H. Morrogh, *Research Mgr.*
British Cast Iron Research Assn.
Birmingham, England

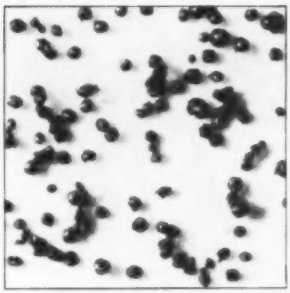


Fig. 11 – Graphite particles in spherical form were obtained from nodular cast iron by dissolving the iron in dilute acid and treating the residue with hydrofluoric acid to drive off the silica. X100.

Cast iron having the graphite in the form of spherulites or spheroids in the as-cast state is a new material and deserves a name which will distinguish it from gray cast iron and malleable iron. The term decided upon should be simple and readily acceptable and yet clearly distinguish this material from other cast ferrous products. Among the more widely used terms designating this new type of cast iron are: "spheroidal-graphite cast iron," spherulitic cast iron," ductile cast iron," and "nodular cast iron."

The graphite particles shown in Fig. 11 were obtained by dissolving nodular cast iron in dilute acid and treating the residue with hydrofluoric acid to drive off the silica. Almost all of the graphite is in the form of spheres or balls and, since most of them are distorted, the term "spheroids" probably describes them more accurately.

From the standpoint of accuracy, the term "spheroidal graphite cast iron" probably should be first choice. The only valid objection to its use might be that it is rather cumbersome. If this objection could be overcome, the use of this term would result in less confusion than that of any other term. The term should also be applied to irons which have been cast white and annealed providing sufficient magnesium or other element is present to assure formation of spheroidal graphite rather than flake aggregates.

Although the use of the term "ductile cast iron" may be justified on the basis of appreciable ductility possessed by some of these irons, the term is not always applicable to this material. In some applications high strength and hardness are much more important than ductility. An iron of this type either heat treated or alloyed to produce a tensile strength of over 125,000 psi would not be expected to possess appreciable ductility. Certain properly inoculated alloy irons having flake-type graphite have been known to show as much as 4 per cent elongation on a tensile test. Such an iron might be classed as "ductile" and yet not have the structure possessed by a properly treated iron with spheroidal graphite.

From the standpoint of simplicity and convenience, the term "nodular cast iron" or "nodular iron" is hard to improve upon. The term has the objection that it is not as accurate as "spheroidal graphite cast iron." Although the graphite found in malleable cast iron is of the flake aggregate type, the term "nodules" has often been used to designate such flake aggregates. By definition, the term is thus correctly used. Malleable iron has seldom if ever been referred to as

Fig. 12 (above) – Temper carbon in annealed malleable iron appearing as flake graphite. Etched, 2 per cent nital. X500.

Fig. 13 (left) – Graphite formation in annealed ductile iron appearing as rounded masses with radial structure. Etched, 2 per cent nital. X500.

"nodular iron," and it is not likely that its name will ever be changed.

"Nodular cast iron" has been developed to the point where setting up specifications seems to be in order. It is suggested that the present ASTM system be extended through the use of appropriate suffixes. For example, an 80-N-5 iron might be one with 80,000 psi minimum tensile strength, nodular iron structure, and with minimum elongation of 5 per cent.

D. E. Krause, *Exec. Dir.*
Gray Iron Research Institute
Columbus, Ohio

The writer prefers to apply the term "ductile iron" to the newest cast ferrous material because it best describes the outstanding property of the material—ductility (with high tensile strength) as-cast.

The word "nodular" should not be used in connection with "ductile iron" because it is frequently associated with the form of graphite found in malleable iron and known as "temper carbon." The 1948 edition of ASM *Metals Handbook* in the section entitled "Definitions of Metallurgical Terms" defines temper carbon as "the free or graphitic carbon that comes out of solution, usually in the form of rounded equiaxed nodules in the structure, during the graphitizing or malleablizing of white cast iron."

Careful comparison of photomicrographs of malleable iron with those of ductile iron shows that the temper carbon in malleable iron and the graphite formation in ductile iron are entirely different. Figures 12 and 13 show the structures of malleable iron and ductile iron. At X500 magnification it is evident that the temper carbon in malleable iron is in reality an aggregate of flakes, while the carbon in the ductile iron appears as solid rounded masses having a radial structure. The latter is an entirely new type of graphite formation.

In the writer's opinion, the words "nodular," "spheroidal," and "spherulitic," regardless of definitions, are inappropriate for describing the new iron as they refer to types of graphite formations, while the point in question is that of selecting the correct terminology for an iron and not for one of the microconstituents present in the iron.

W. W. Levi, *Met.*
Lynchburg Foundry Co.
Lynchburg, Va.

The dictionary defines the word "nodule" as a little knot or irregular round lump. Therefore, it would appear that the word "nodular" will fit both the uniformly rounded forms of graphite as well as the irregularly rounded forms of graphite which occur in the new type of iron in the as-cast condition. The accompanying photomicrograph of the structure shows both types of nodules. It has been our experience that in most cases the structure of this iron at X250 will show graphite in both forms (Fig. 14).

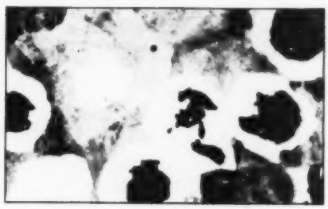


Fig. 14 – Graphite types in as-cast structure. X250.

While the terms "spheroidal" and "spherulitic" may be more applicable to the round forms of graphite, they do not seem appropriate to the irregular forms.

It is true that malleable iron contains graphite in the form of nodules, but this occurs only after the malleabilizing heat treatment and not in the as-cast condition. Generally speaking, the nodules in malleable iron are much smaller than those encountered in nodular graphitic cast iron.

For these reasons it seems to us that the term "nodular cast iron" is more appropriate for this material.

J. C. H. Stearns, *Mgr., Ingot Sales*
The Dow Chemical Co.
Midland, Mich.

J. C. H. Stearns

W. W. Levi

NINTH NEW ENGLAND REGIONAL FOUNDRY MEETING DRAWS 350

Walter M. Saunders, Jr.
Consulting Chemist
Providence, R. I.

TWO DAYS OF TECHNICAL MEETINGS, a conference dinner and a dinner smoker were highlights of the Ninth New England Foundry Conference, held at the Massachusetts Institute of Technology, Cambridge, Mass., October 8 and 9 and attended by 350 foundrymen.

Two technical sessions, the Lumen S. Brown Lecture, and the conference dinner in the evening made up the program for Friday, October 8. Saturday's all-day program included four technical sessions and a session on *"Humanics."*

The Conference was sponsored by the New England Foundrymen's Association, the American Foundrymen's Society's MIT Student Chapter, Massachusetts Institute of Technology, the Boston Chapter of the Non-Ferrous Founders' Society; Connecticut Foundrymen's Association, Connecticut Non-Ferrous Foundrymen's Association, and other metals organizations.

Dr. John Chipman, head of MIT's Department of Metallurgy, opened the Conference Friday morning with a welcoming address and an outline of MIT's foundry facilities and educational program.

Outlines Gating and Risering Principles

Fred G. Sefing, International Nickel Co., New York, opened the Conference technical program with a paper on *"Gates and Risers,"* in which he emphasized the basic principles of feeding metal into molds.

Mr. Sefing stressed the necessity for clean metal and reviewed the use of swirl gates, runners from vertical sprues, knife gates, slag traps, and blind risers. Mr. Sefing concluded his talk by citing improper venting of cores as an important cause of defective castings.

At the luncheon meeting, Frank G. Steinebach, Penton Publishing Co., Cleveland, gave the 1949 Lumen S. Brown Lecture, speaking on *"Public Relations in the Foundry Industry."*

Jos. A. Gitzen, Delta Oil Products Co., Milwaukee, opened the afternoon technical session with a paper on *"Mold and Core Sand Additions."* Mr. Gitzen reviewed the advantages and disadvantages of sea coal, various types of core binders, and binders in sand.

The annual conference dinner featured as speakers Dr. John Wulff, head of MIT's Division of Mechanical Metallurgy, who described the Institute's foundry educational program, and Wallace G. Strathern, president of the National Society of Sales Training Executives, whose subject was *"Standing Still or Going Ahead,"* in which he outlined some principles of better personnel and public relations in industry.

Clyde A. Sanders, American Colloid Co., Chicago, opened the Saturday morning technical session with a paper on *"Sands—From Maine to California."* Mr. Sanders covered the effects of grain distribution on permeability and showed how sands from different localities vary in this respect.

The balance of the morning was devoted to a session on *"Humanics,"* with Sherman Rogers, Sherman Rogers Publications, Chicago, discussing the history of organized labor and its effects on industry.

Simultaneous sessions on *"Cupola Practice"* and *"Making Bronze Pressure Castings"* opened the afternoon session. The cupola session was addressed by B. P. Mulcahy, Fuel Research Laboratory, Inc., Indianapolis, who showed how such factors as air, metal, fuel, equipment, and methods of operation must be combined in successful melting practice. Speaker at the bronze session was James O'Keefe, Exomet Inc., Conneaut, Ohio, who discussed causes of unsound bronze castings, melting, gating, risering and materials.

The final technical session featured a paper by C. O. Burgess, Gray Iron Founders' Society, Cleveland, on *"Nodular Cast Iron."* Mr. Burgess predicted a bright future for nodular iron as soon as reproductibility can be obtained, stating that he believes nodular iron will occupy a field of its own and will be used for heavy castings difficult to malleabilize.

A few of the 350 foundrymen who attended the Ninth New England Regional Foundry Conference, held October 8 and 9 at the Massachusetts Institute of Technology, Cambridge, Mass. Program of the two-day meeting featured six technical sessions, a session on "Humanics," *a Conference Dinner and luncheon. Eleven technical organizations combined to sponsor the Conference.*

MODERN FOUNDRY METHODS...

ENGINEERING METAL PATTERN EQUIPMENT

Methods for precision engineering of metal pattern equipment are described here by H. A. Burton, Canadian Car & Foundry Co. Ltd., Longue Point Works, Montreal, Canada. With other prize-winning entries in the Annual Technical Paper Contest of the A.F.S. Eastern Canada Chapter, the paper was presented at the Apr. 8, 1949, chapter meeting.

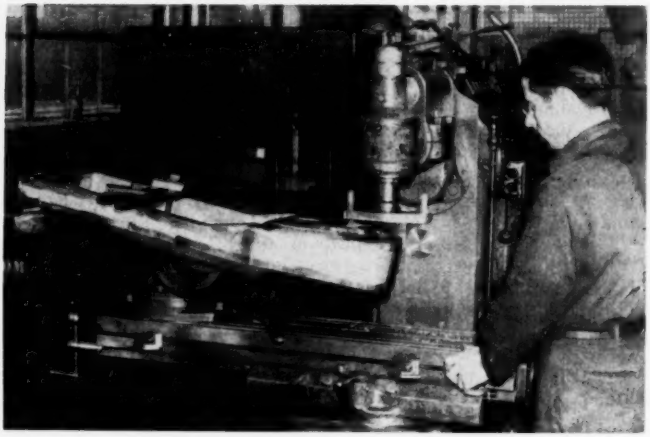
As cast from the master pattern, some degree of distortion is generally found in the metal pattern. For this reason the pattern should be made with approximately ⅛ in. matching allowance.

The milling machine appears to be the most versatile and accurate machine for this type of work. The longitudinal, transverse, and vertical feeds are graduated in 0.001 in., allowing precision machining of the pattern without difficulty.

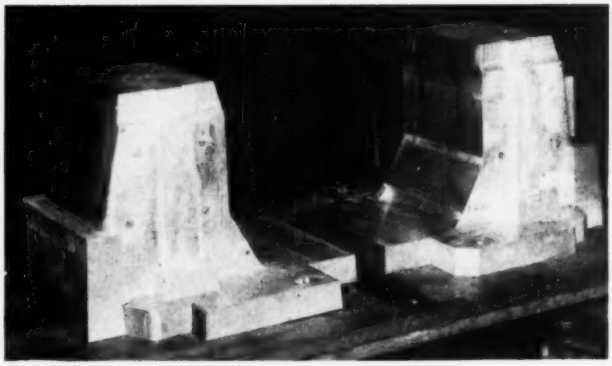
Undoubtedly, the fly cutter is the best type of tool for machining patterns. It is inexpensive to make up as against a costly milling tool with a number of teeth. Rapid cuts can be taken if tungsten-carbide tool bits are used, and the tool bits can be readily removed and ground. The milling cutter has a tendency to clog up, especially with aluminum; with fly cutter operation the chips are thrown away from the job, leaving a good finish suitable for pattern draft, etc.

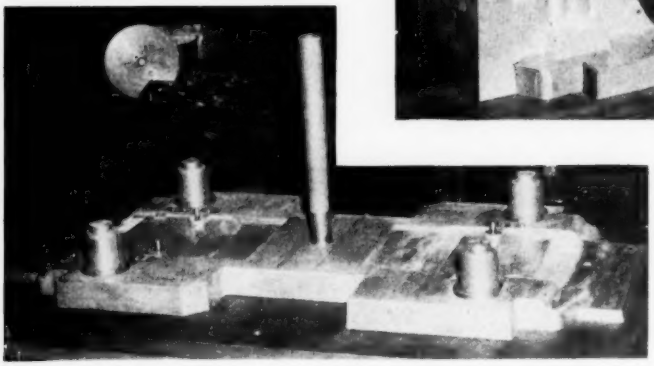
Patterns made of bronze or cast iron are suitable for long-run production jobs, having the ability to retain shape and size with a minimum of wear over long periods. Unfortunately, these metals are more costly to machine than aluminum but the higher costs are quickly absorbed in the foundry, and in the cleaning and inspection departments.

Machining of aluminum patterns is extremely rapid. They also retain shape and size over long periods, although not as



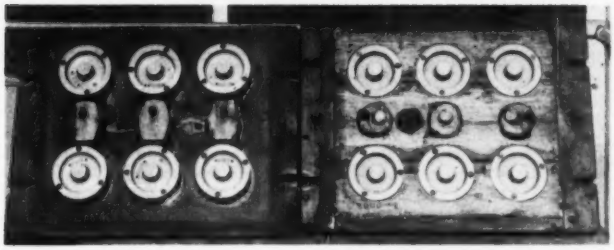
A fly cutter is used with a vertical head in this pattern machining operation. Adapters are made for horizontal work, or when a large fly cutter is necessary.





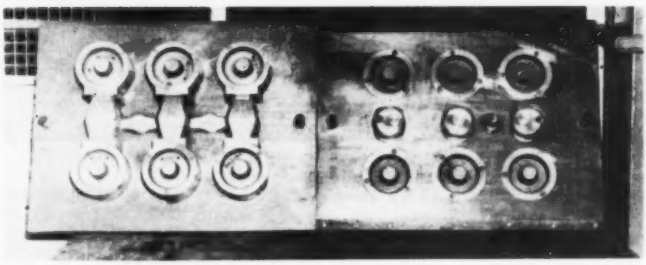
Cope and drag patterns (left and above) used in producing the trial casting (opposite page) were machined with a 14-in. diameter fly cutter. The pattern finishes were entirely free from chatter marks.

...MODERN FOUNDRY METHODS



◀ *While in storage the wood match board of the cope pattern shrunk as much as 1/8 in. between the joints. The resulting mismatch produced fins on the castings.*

▼ *Cope and drag patterns were repaired and the cope pattern mounted on a metal match plate. Core prints, heads, and gates and risers were converted to metal.*

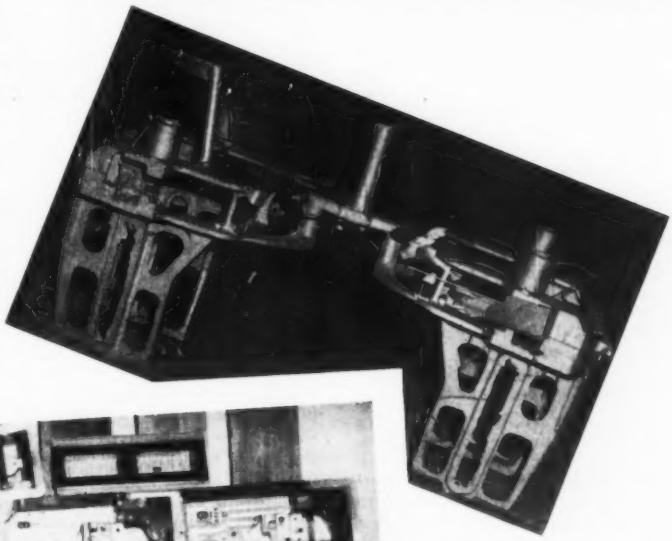


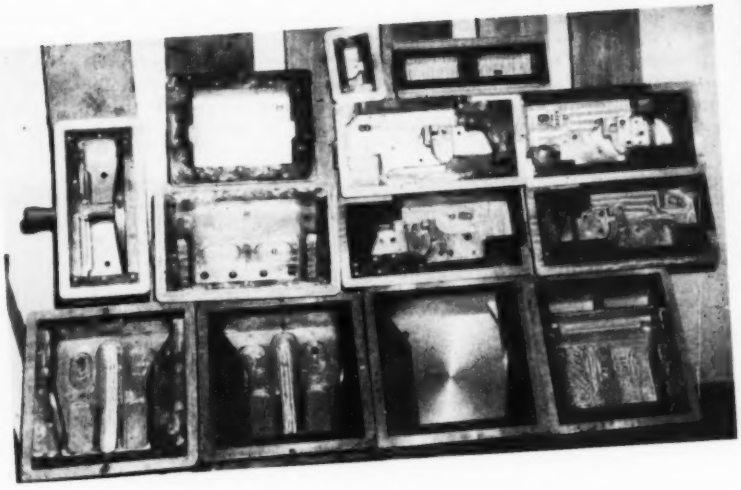
well as bronze and cast iron. Aluminum, being a much softer metal, is easily damaged by rough handling. It has a tendency to wear more quickly by the abrasive action of sand, especially where there are sharp corners.

Metal faced wood patterns resist wear better than all-wood patterns, but are not altogether desirable for long runs. As with wood they are subject to size and shape changes due to atmospheric conditions, and from the tendency of sand to creep between the metal and wood.

Metals which are suitable for patterns may also be applied to core boxes. On large boxes a loose base is more practical than a solid box, permitting easier machining to shape and size.

In many applications the wooden match plate is a poor foundation for the pattern. In the illustration the cope patterns are shown mounted on a wood match board, and the drag on metal. This equipment was placed in storage after a run, and when taken from storage the

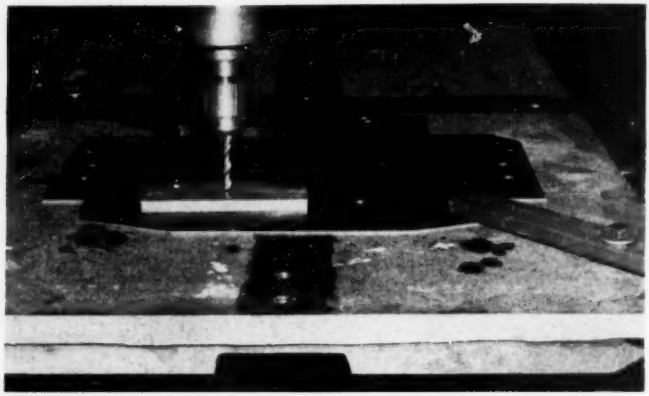




▲ *A trial casting is used to determine the changes necessary on the pattern equipment. Final adjustments are made on this basis and the pattern is ready for production.*

◀ *Core boxes are also made in metal. The duplicate set shown was made in aluminum with carbon steel facings or liners. Facing edges can be flame hardened to resist wear.*

MODERN FOUNDRY METHODS...



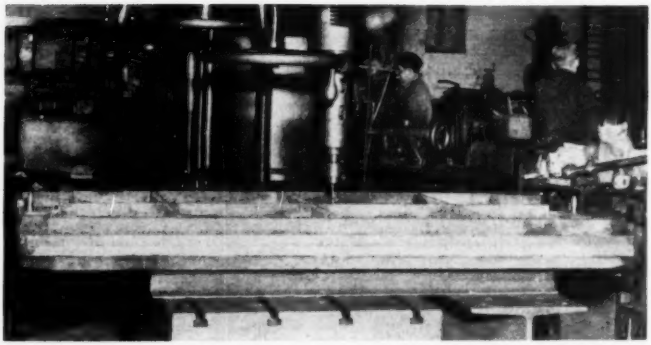
A mild steel template, cut to the pattern contour, is used in locating dowel holes to be drilled in cope and drag match plates. The adapter is of high-carbon steel with a boss machined on one side to fit the holes drilled in the template. The adapter is drilled through the boss to desired dowel pin size and hardened for wear resistance.

Dowel and bolt holes have been drilled in one match plate and the plate placed on top of the other match plate. Cope and drag faces are kept together with dowel pins in the flask pin holes.

cope board was found to have shrunk as much as ⅛ in.

A method for obtaining a satisfactory match between cope and drag patterns has been developed. A mild steel template 1/16 or ⅛ in. in thickness is cut to contour of the pattern. This does not necessarily mean that the template must be filed to general contour. A two or three point bearing is all that is required to ensure a match. Dowel holes are then drilled ¼ in. larger than the required dowel pin size in the template. A block of high carbon steel, minimum ½ in. thickness, is machined on one side with a boss turned to close tolerances to fit the drilled template. This adapter is drilled to desired dowel pin size, concentric with the turned boss, and hardened against wear in drilling.

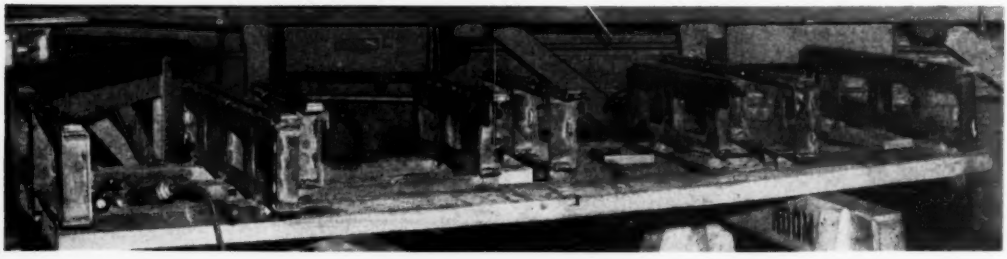
Dowel and bolt holes are drilled through on match plate, which is then placed on top of the other plate, keeping cope and drag faces together with dowel pins in flask pin holes.



Dowel pin holes are drilled to a depth of approximately ½ in., and bolt holes are drilled through the plate.

Adapter boss sizes are standardized for all templates. Dowel pins can be made up in three sizes, ¼ to ⅜ in., depending on the size of pattern to be matched, thus eliminating a large amount of equipment. If at any time the pattern becomes mismatched through wear, it is necessary only to plug the dowel pin holes and re-drill to the template.

The steel fabricated core-scraping jig is a valuable tool where core size must be maintained. The illustration (below) shows a set of core-scraping jigs in process of construction. It is advisable to have adjustments where the core is to rest in the jig to meet any desired change.



QUALITY CONTROL REVIEW . . .

Test Procedures for Quality Control of Gray Iron Castings

F. J. Walls
Metallurgist
The International Nickel Co.
Detroit

ENGINEERING SPECIFICATIONS for improved properties in gray iron castings place great responsibility on producing foundries for adequate control methods to fulfill the requirements of the consumer's design calculations. Foundrymen, in the not too distant past, considered a casting usable if it conformed to blue print dimensions and had no visible defects. The consumers' principal concern too frequently was machinability of the castings with little consideration for the mechanical and physical requirements of the designing engineer who, in turn, resorted to "beefing up" of structures to avoid failures.

Pioneer foundrymen, some 50 years ago, realized the necessity for the application of science and control in the foundry, and this led to the founding of the American Foundrymen's Society for the dissemination of knowledge to the industry.

If we were to write a chronological history of the improvements in iron properties, we would probably start with the all too common concept that cast iron is a versatile material, readily castable into most any shape, easy to machine, cheap, but weak and brittle. While this concept began to change rapidly during World War I, it was not until the middle twenties that cast irons became recognized as a family of castable alloys with engineering properties unobtainable in any other cast metal. From that time a gradual increase in the obtainable properties, with a greater degree of certainty brought about principally by combining science with the art of founding, has been realized.

In 1921 gray iron castings were specified to exhibit minimum (arbitration bar) tensile strengths of 18,000 to 24,000 psi. The ASTM specifications for 1936 called for seven classes of gray iron requiring minimum tensile strengths from 20,000 to 60,000 psi. How was this improvement brought about? Through use of equipment and test procedures for quality control in the manufacture of gray iron castings.

Indirect Materials

Our first consideration is the raw materials entering into the process of producing a quality casting. Some 8810 lb of materials are consumed in producing 2000 lb of unmachined automotive gray iron castings, or approximately the castings required for three automobiles. This figure was accumulated from records during a year in which 68,169 tons were melted in a particular foundry, with a yield of 70 per cent good castings to total iron charged. This is summarized as follows: indirect materials, 3096 lb; direct metals, 2857 lb; air, 2857 lb; total, 8810 lb.

The indirect materials are made up of some 30 items, the largest of which is core sand (1575 lb), and includes refractories, bonding materials, sea coal, core wires, fluxes (148 lb), and coke at a 1:8 ratio (357 lb), etc. The direct metals are pig iron, scrap steel, ferroalloys and cast scrap. The indirect material, air, is a costly and important item in quality control procedure.

The American Foundrymen's Society has developed, through its Sand Division, standard methods for testing fineness of sands, moisture, bond, permeability, strength (green, dry, and hot), sintering point, and hardness. Detailed methods and standards can be found in the FOUNDRY SAND TESTING HANDBOOK published by A.F.S. In addition to these standards are several practices which must be controlled from the time sand is placed in the mixer until it is set in the mold as a finished core:

1. Careful proportioning of sands, water, and bonding materials.
2. Ramming or blowing into core boxes.
3. Reinforcing.
4. Driers or supports when removed from boxes.
5. Baking time and temperature.
6. Cooling.
7. Assembling.
8. Cleaning.
9. Inspection (dimension, cleanliness, vents, storage).
10. Delivery (handling).
11. Check core boxes (wear, fit, fin elimination).

Five papers, sponsored by the Annual Lecture Committee of A.F.S., were presented at Lecture Course Sessions of the 52nd Annual A.F.S. Meeting. In this issue, test procedures for quality control in the gray iron foundry are described. Of other papers in the series, steel was published in the January, 1949, malleable iron in the July, 1949, and brass and bronze in the September, 1949, issues of *American Foundryman*. Procedures for aluminum and magnesium quality control will appear in a future issue.

Proportioning and Mixing Core Materials

In many foundries one core mixture may be sufficient for all the cores used, but in most production foundries several mixtures are necessary and usually desirable from the economic standpoint. The chief factor controlling the economics is the location of the foundry with respect to the supply of raw materials and manufactured ingredients that enter into a usable core mixture. We will not consider the economics of different materials, but will confine our discussion to the control of the processing of the materials selected.

Water is an important part of every core mixture and the percentage used must be controlled to within rather close limits if uniform castings are to be expected. The trend has been to dry the sands and add the required amounts of water, this amount varying with the other materials used in the mixture and with the method of forming the core. Unquestionably, this

is the most desirable method. However, when drying is not possible, moisture determinations of the sand must be made regularly to insure the proper water additions for each batch in order to maintain uniformity of cores from the standpoint of hardness, size, baking time, permeability, green and dry strength.

If dry sand is used, the proper portions per batch may be controlled by volume measurements, but when variable wet sand is used, weighing is perhaps more accurate because the amount of sand in a given volume varies with the moisture content. The mixing cycle is usually a matter of choice and is dependent upon the materials making up a batch.

When green core strength is developed by the admixing of a dried sharp sand and a dried bank sand with controlled amounts of water, dry mixing before adding water and core oil is perhaps the best technique. When green strength is enhanced by adding cereal binders to a sharp sand, the same procedure no doubt holds true, but when wet sands and cereal binders are used, it becomes a matter of experience as to the best sequence of additions, including the core oil.

Mixing time is dependent upon the foregoing factors and the type of mixer used. Two factors, therefore, are important in the mixing of core sands and must be controlled: (1) proper proportioning of the several ingredients; and (2) a definite time and sequence of mixing. For controlling the properties of cores as to green and dry strengths, permeability, dilation characteristics, baking temperatures and time, one should consult the FOUNDRY SAND TESTING HANDBOOK and H. W. Dietert's MODERN CORE PRACTICES AND THEORIES, both published by A.F.S.

Core Binding Materials

Many kinds of core binders are used, the properties of which are outlined in detail in Dietert's book. Standard methods of testing and suggested specifications for each class are given, together with comments on the performance to be expected. Whatever the binder used, the optimum amount required to give the desired properties for specific cores must be insured by careful weighing or measuring for each batch.

Time and temperature of baking are dependent upon several factors which require production control. Cores with relatively large sections obviously require longer baking time than those with relatively light sections. Where continuous ovens are used, problems arise that require careful planning and control. For each type of core binder or combinations of core binders used there is a definite range of baking temperatures within which maximum properties in the core are obtainable. This temperature range, for most compounded binders, is usually rather narrow and necessitates automatic temperature controllers which require regular care and checking.

Where oxidizing-type binders are in use it is important that oven gases be checked periodically to insure the presence of sufficient oxygen to produce uniformly baked cores.

The author, second from the left, illustrates a point in casting quality control during a plant visitation at the foundry of the Ford Motor Co., Dearborn, Mich.

Preparing Cores

Assembling, cleaning, special preparation of core surfaces, inspection, storage and delivery of cores present many problems in the realm of quality control. Fixtures, core paste, tie bars (bolts, wires, lead, etc.), and repair daubing are sources of many defective castings and should be watched carefully. Core washes especially should be checked as to quality and quantity. Whether the cores are dipped or sprayed before or after baking, the specific gravity and consistency of the coating should be checked and maintained within a minimum allowable tolerance. Too much core wash may defeat its purpose, and too little is useless. Defects caused by washes and cores in general will be discussed under the heading of inspection.

Storage of cores for long periods, especially in humid seasons, should be avoided unless such cores are subsequently passed through a drying oven before delivery to the molding department. To determine whether or not subsequent redrying is necessary, test samples may be checked in the laboratory to determine if moisture absorption is above an allowable maximum, and thus insure freedom from core blows.

If casting quality is to be maintained, there must be quality control of all the materials entering into the mold into which the cores are placed to form the refractory cavity for reception of molten iron.

While the molders' principal interest is in obtaining a true replica of the pattern in the finished casting, free from molding defects, with a minimum of expended effort, he must necessarily be concerned with the uniformity of the components as they are delivered to him to assemble, manufacture or create the receptacle for the design involved.

A housing must be provided for this cavity or series of cavities, and this may consist of a snap flask with bottom board, a huge pit in the foundry floor, a wooden or metal two-part flask, or a complicated flask arrangement with many parts. If, as in most production work, the cope and drag two-part flask is used, they must be kept in good mechanical condition to avoid scrap or inferior castings.

Maintain Flask Accuracy

Flasks must be rigid enough to avoid swells, and have sufficient bars or sand supports to eliminate drops. In match plate flask work the closing pins control the accuracy of the match between the cope and the drag, and should be checked periodically by gages if quality is to be maintained.

While the flask bars may be considered as only supports for the rammed sand, their location is also impor-

tant as bars that project too close to a pattern are often the source of hard spots in castings, as well as the cause of fins due to warpage of the bars and cracking of the mold surface under heat from the metal. In addition, improper bars often interfere with ramming, promoting soft spots in the mold face, resulting in swelled castings with attendant internal shrinkage which is discovered only after machining.

Control Molding Sand Uniformity

Let us now consider the molding sand and the control of its uniformity from the time it enters the storage space until it becomes a completed mold. If natural sands are used, we assume that the proper bond and fineness of the silica grains were determined prior to purchase, and we usually rely upon the vendor to furnish it uniformly as required. Shipping and storage of molding sand presents many problems, and lead to the necessity for proper conditioning equipment and laboratory control of the resulting mixture as it enters the flask.

Modern equipment in the form of mullers, paddle mixers, revivifiers, power screens, or riddles and sand cutters, if used properly in preparing the sand, will facilitate quality control. Prior to mixing, however, we must carefully determine and continually check the amount and quality of each ingredient making up the molding material so that it will have the proper flowability, ramability, permeability, moisture, green strength, dry strength, sintering point, and thermal expansion characteristics.

For each classification of castings and molding material used there is an optimum value for each of the physical and mechanical properties of the sand. Most of these values have been established by the A.F.S. Sand Testing and Research Committees over the past quarter century, as have been standard methods for determining these values, all of which are explained in the FOUNDRY SAND TESTING HANDBOOK.

The point to emphasize here is that it is necessary to control these values, after they have once been determined, within the tolerances required to maintain quality. Every effort should be made to overcome the many difficulties encountered, some of which may be inherent in the equipment or layout. Inadequate cooling time in mechanical systems is one of the greatest hinderances to proper sand control.

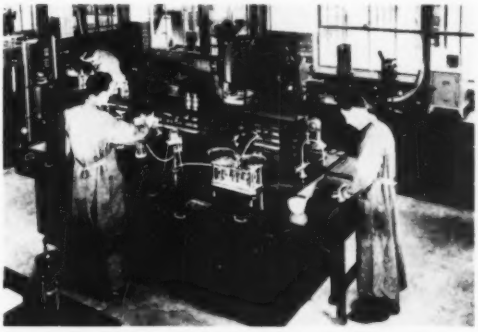
Frequent Determinations Made

For each casting or ton of castings poured in a given sand heap or a given system, definite amounts of bond and moisture are lost, and these must be replaced. Also, a breaking down of a certain amount of the sand grains occurs in the heat-affected zone next to the casting. Where large production is involved, it sometimes becomes necessary to remove a certain percentage of these fragmented grains or fines in order to maintain desirable permeability.

Moisture, green strength, and fineness are determined and adjusted at least hourly in production shops, and in some batch-type systems with each batch. It is not quite so easy to determine or to adjust the dry strength or expansion characteristics but, through experience, standards can be set up and additions made on a per casting basis per unit of sand required.

Some molds require special properties other than those obtainable in the standard sand, which makes necessary the use of facing sands rich in sea coal or cereal binders, mold sprays, and skin drying. Where special facings are used care must be taken to insure uniformity in quality as well as in quantity. Mold sprays should be prepared, checked, and delivered to the molder under laboratory control. Skin drying, when done by hand methods, requires skill and experience, and with mechanical means requires control of temperature and time.

Each molding method requires sand of different characteristics. For hand ramming, the proper sand is somewhat determined by the ideas of the master



Foundry sand control tests are conducted in the sand laboratory, American Brake Shoe Co., Mahwah, N. J.

molder and the design, but in mechanical molding such as slinger, jolt, jolt-squeeze, or squeeze, a definite controlled sand is warranted for each method. A standard mold hardness tester is available and should be used regularly to assure, in particular, dimensionally uniform castings free from internal porosity.

Mold venting is a part of the molders' duties, and in molds where it is not possible to provide permanent vents on the pattern, vents must be provided in the mold for the proper exit of core gases and from cavities where gas may accumulate faster than the premeability of the sand will allow it to escape. Large cores, or thin cores having large exposed surface with relatively small volume, generate a large volume of gas very rapidly, and require especially careful venting to prevent building up large pressures.

Cores are presumed to be properly vented in the coreroom, with channels leading through prints which must be connected with an opening in the mold wall to provide an exit to the outside of the flask. Many core blows can be attributed to the molder for failure to provide proper escape exits. The pattern maker is responsible for print fits which will prevent molten iron from sealing off the vents. Core vents can be tested by blowing smoke into the print exit and observing its escape through the core surfaces, or by wire feelers before seals have been applied to the vent rod withdrawal holes in the core.

Many excellent papers on gating and risering have been published in A.F.S. TRANSACTIONS. Yet no mathematical formula known is broad enough to take into

consideration all the variables entering into the proper design of the entrance passageways for the liquid metal. Experience has taught that certain fundamentals must be adhered to in order to produce quality castings. For any production casting, there is an optimum pouring time and metal temperature. Pouring time is dependent upon the design of the gating system if we assume that the temperature and fluidity of the metal are constant.

Gating System Functions

Solidity, or freedom from shrinkage cavities, is the most obvious property of a casting affected by the gating. Uniformity of hardness and strength are to a certain measure functions of the gating system. Warpage, cracking, and dimensional tolerances may be controlled by gating.

Proper gating is "that definite location of ingates of correct dimensions and numbers to avoid a defective casting." We must assume that the passageways leading from the ladle lip to the ingates provide clean metal of the required temperature, volume, and velocity. Whether these passageways are in cores or green sand, they may be checked with a stop-watch to determine any deviation by observing pouring time, and this procedure should be regularly followed.

Pouring rates may vary from a few hundred pounds to several tons per minute, depending upon shape and size of the casting and upon temperature and fluidity of the metal. Pouring time is one of the easiest of control tests and the most often neglected. It is the only single test that gives one a quick check on the condition of the core boxes, the patterns, and the metal. It provides a means of checking for both intentional and unintentional changes that have occurred either in the mold cavity or the gating system. Any deviation from the predetermined correct pouring time indicates that such changes have taken place.

The many forms and shapes of chaplets used to provide support and spacing of cores in the mold are the only commodities other than molten metal, with the exception of internal chills, that form a part of a salable casting. They should be selected and checked for dimensional accuracy and ability to form a homogeneous part of the casting free from segregation, gas holes, or leakers due to failure to fuse with metal. They should be kept free of contamination, stored in a dry place, and laboratory checked for proper coatings. Castings scrapped for other defects should be sectioned through chaplet bosses and internal chiller areas to check results.

Metallurgical Control

Incoming raw materials which go into the processing of the metal for a gray iron casting may be classified generally under two headings—metallic materials and non-metallic materials. Metallic materials can be further classified as primary metals and secondary metals. Under primary metals are pig irons and ferroalloys, and under secondary metals are cast iron scrap and steel scrap.

Pig irons are broken down into 284 grades in ASTM *Specification for Foundry Pig Iron, A 43-45 T.* This breakdown pertains only to the chemistry of the pig iron and does not mention the physical structures of the pig itself, nor does it include the carbon content which is one of the most important elements in making quality castings. In an individual foundry one grade of pig iron may meet the requirements, but it is a good policy to have at least three or four grades at hand.

After selecting the grades desired, uniformity may be controlled by the standard sampling and chemical analyses as outlined in the 1946 book of ASTM—*Methods of Chemical Analyses of Metals.* In addition to the composition of pig iron, it is usually advisable to have an understanding with the producer as to pig sizes, this having an important bearing on the melting process in different size cupolas.

Ferroalloys are available in many compositions and shapes, and should be selected to fit the practice standardized in a particular foundry.

Specifications for cast gray iron scrap and steel scrap are not completely standardized and definite agreement on specifications should be reached between each supplier and consumer. A good scrap classification is given in the A.F.S. Handbook of Cupola Operation, pp. 255-263.

Testing and Sampling Coke

Coke presents one of the most difficult problems in the metallurgical control of foundry products. Even though the supplier may conform to all the standard specifications as set up by ASTM, this does not mean that desirable results are obtainable without constant vigilance throughout the handling and melting processes. Standard methods for testing and sampling coke are listed by ASTM as follows:

D 141-23 Method of Drop Shatter Test for Coke.
D 167-24 Method of Test for Volume of Cell Space of Lump Coke.
D 271-46 Methods of Laboratory Sampling and Analysis of Coal and Coke.
D 292-29 Method of Test for Cubic Foot Weight of Coke.
D 293-29 Method of Test for Sieve Analysis of Coke.
D 294-29 Method of Tumbler Test for Coke.
D 346-35 Method of Sampling Coke for Analysis.

In addition to the foregoing tests, only one test with which the author is familiar will determine definitely how much carbon can be expected in resulting iron, what the temperature will be, and how fast it can be melted with the particular coke—that is by trial.

Refractories for cupola linings may be in the form of fire brick of standard shapes, special cupola block shapes, or of the monolithic plastic type placed by ramming. Whatever the shape or type used, care must be taken to insure uniform quality from day to day. Standard tests as set up by the American Society for Testing Materials should be used for this control:

ASTM C 24-46 Pyrometric Cone Equivalent of Refractory Materials.
ASTM C 133-39 Cold Crushing Strength and Modulus of Rupture.
ASTM C 134-41 Size and Bulk Density of Refractory Brick.
ASTM C 18-45 Chemical Analysis of Refractory Materials.

Most important of the cupola refractories are the tap-hole brick and the slag-hole brick. These can be

purchased to size and quality specifications and should be stored in a dry place to avoid operating troubles.

Daubing mixtures for cupola repair and ladle repair should be established and controlled as to proper proportions of ingredients and mixed consistency.

Cupola bottom sand is the most important sand in any foundry and should be uniform from day to day. After determining the most suitable sand for the cupola in a particular foundry—which is dependent upon the sands and clays available—preparation of the sand should be watched as to mixing, screening, amount of moisture added, amount of mixture used, and proper ramming techniques in placing the bottom.

Cupola Blast Air

The largest single item entering into gray iron production is the blast air necessary for combustion of fuel in the cupola. It is also one of the most variable items. Under standard conditions of temperature and atmospheric pressure (0° C, 760 mm of mercury) a cubic foot of dry air weighs 0.0747 lb and contains approximately 23.1 per cent of oxygen by weight and 76.9 per cent of nitrogen. By volume under standard conditions, air contains 20.9 per cent oxygen and 79.1 per cent nitrogen.

Since a cupola is seldom operated under standard atmospheric conditions, we must resort to measuring devices for adjusting the amount of air necessary for satisfactory combustion of the fuel. Weight and volume measuring equipment are available, and should be checked and calibrated as required to assure accuracy.

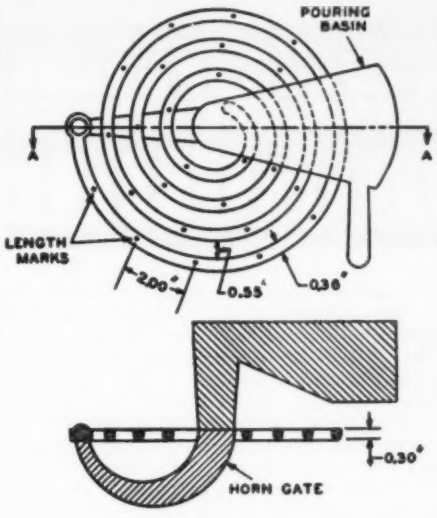
The moisture content of the air delivered into the combustion zone of a cupola is a variable—unless controlled within fixed limits—that must be reckoned with in the quality control of the uniformity of gray iron. Much work has been done and is being done relative to the effects of moisture in the blast on the properties of gray iron.[1,2] Preheating blast air to a constant temperature is another means of eliminating the moisture variable, and may have economic advantages in many operations.

The HANDBOOK OF CUPOLA OPERATION, compiled by committees of the American Foundrymen's Society, is a comprehensive reference book which should be in every foundry operating a cupola. It covers in detail equipment, materials, and recommended practices for controlling the quality of cupola output.

Blast Pressure

A blast pressure gage does not measure the amount of air entering the cupola, but it does inform the operator as to the resistance met by the ingoing air. All cupolas should be equipped with a pressure gage, preferably a recording type, as it is the best indicator of the invisible conditions within the cupola that have important bearings on the resulting iron.

Although pressures may be varied from 4 to 40 oz per sq. in. in the same cupola, they cannot be varied without disastrous results unless other adjustments are carried out simultaneously. It is well to remember that the velocity of the air entering through the tuyeres into the melting zone varies with the square root of the pressure in the windbox, and is represented by the formula $V = 5280\sqrt{P}$, where V is velocity in feet per minute and P is pressure in ounces per square inch.



The fluidity test spiral is frequently used as a control measure. The length of spiral, as measured by the 2-in. reference marks, is an indication of metal fluidity.

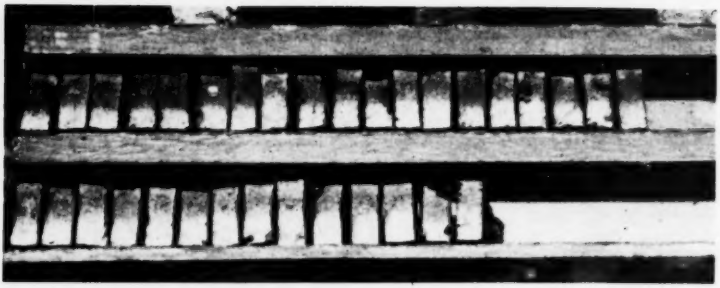
This formula indicates the speed at which the oxygen of the air combines with the carbon of the coke to produce the heat necessary for the desired temperature of the iron. In a cupola operating with a 48-in. bed and 16-oz pressure, it requires about 1/88 of a second for the air and gases to pass through this distance.[3]

Several precautions must be observed in the routine repair of a cupola. It is most important that patching should not be attempted over slag adhering to the lining. This means close supervision of the chipping-out operations before new refractories are applied. Proper dimensions should be maintained after each day's repair, and no deviations should be made without due consideration of the effect a change might have upon the operation and melting rate of the cupola.

When a bosh is used, a template should be provided to maintain daily uniformity. It is always good practice to avoid bulges or shelves in a cupola and to keep the lining as smooth as possible to eliminate bridging or unnecessary disturbances of the descending stock.

Whichever of the many ways of lighting up a cupola bed is chosen, it should be maintained on a schedule previously set up to fit the needs of the foundry. A definite time for the proper burning of the initial measured quantity of coke should be established and strictly adhered to.

The bed height is dependent upon many factors but may be estimated from the formula *Bed Height* $= 12\sqrt{P} +$ *a carbon factor*, where P is in ounces per



Metal quality control in the car wheel foundry of the Technical Society of General Founders, São Paulo, Brazil, is illustrated by the chill test blocks collected at the cupola control station during the day's run.

square inch and height is in inches. The carbon factor or the additional height necessary to obtain the desired carbon may vary from zero to 20 in. and can be determined only by experience with the coke, materials, and operation involved. Under ideal conditions the following table will serve as a guide, but under the present material conditions the carbon factor will be about 6 in. for carbon of about 3.20 per cent.

Pressure (oz /in.^{2})	4	9	16	25	36
Bed Height (in.)	24	36	48	60	72

Provision should be made for accurately measuring the bed height before charging commences, and this height should be maintained at the same level for each heat unless an adjustment is warranted to compensate for the variables mentioned previously.

Charging the Cupola

Every ingredient making up a charge should be accurately weighed if one expects to obtain uniform metal from the spout. It is also important to see that charges are kept to as near the same volume as possible, as well as to the same weight. This means that judgment must be used in proportioning the available cast scrap and steel scrap. Nothing will upset the chemical processes taking place in the cupola more completely than placing all the heavy stock on one charge and the light stock on another charge.

Stock length should never be more than one-third the smallest diameter of the cupola, and its sections should be small enough so that in the melting operation it will not lag behind the charge it is supposed to melt in. The size of the charge is dependent upon the size of the cupola and the kind of melting stock used. After the size has been determined, it is not good policy to deviate from the standard.

The sequence of metals going to make up a charge can best be determined through experience and is somewhat dependent on the charging method used—mechanical or hand charging. Where hand charging is used, pig iron, steel scrap, and cast scrap are usually charged in that order. This order may also be used for mechanical charging, but in some cases the steel scrap is charged directly on the coke.

The amount of coke used per charge can well vary from a ratio of 1 to 5 to a ratio of more than 1 to 10, depending upon the quality of the coke and the desired temperature and carbon content of the metal. Since the production rate of any cupola is dependent upon the fuel burning rate, adjustments must be made in the amount of coke used per charge as well as in the amount of air supplied in order to arrive at the desired melting rate and the desired carbon content.[3]

Normal Cupola Fuel Burning Rates

Cupola Diameter, in.	24	30	36	42	48
Fuel per Hour (coke), lb	450	700	1000	1400	1800
Cupola Diameter, in.	54	60	66	72	
Fuel per Hour (coke), lb	2300	2800	3400	4000	

When the standard amount of coke per charge is once established, changes should not be made except to compensate for unexpected variables which have crept into the process. The size of the coke used should be controlled within certain limits as there are definite relations of coke size to melting rates, carbon pick up, and temperature.[3,4] For the ideal condition the maximum dimension of the coke should be about 10 per cent of the diameter of the cupola in inches.

In many cases natural limestone is the principal fluxing agent in the cupola. The amount required per charge is dependent upon the ash content of the coke and the extraneous materials entering with the charge, and may vary from 30 per cent to 70 per cent of the weight of coke used. It should be weighed carefully and distributed uniformly on each charge. It may become necessary to adjust the amount of stone per charge upward or downward as the heat progresses, or as the extraneous materials vary from charge to charge. This can be judged by the fluidity and appearance of the slag from the cupola. Increased fluidity can be accomplished by supplementing the limestone with fluorspar or soda ash.

Functions of the Cupola

We put five materials into a cupola—refractories, fuel, air, metal, and flux—and take three things out—metal, slag and gases. A cupola performs three principal functions:

1. Melts and superheats the metal.
2. Fluxes (cleans and refines).
3. Controls the carbon in the liquid metal.

The most important function other than heating which a cupola performs is that of carbon control. Two significant points in this respect are: obtaining the specified or desired total carbon; and maintaining the desired carbon throughout the operation.

With proper control of the five materials entering the cupola and the tapping operations of the metal itself, we can control the carbon content of the metal within fairly narrow ranges. Likewise, the temperature of the metal is controlled by controlling the combustion of the fuel. To do this efficiently, we must

endeavor to control all variables that go into the cupola and into its operation.

At this point we have under control the materials entering the cupola and can expect to obtain a uniform product commensurate with the accuracy with which we controlled the ingoing materials. However, the tapping cycle, slagging operation, and blast adjustments play important parts in carbon control and must be carefully regulated. The continuous tap with constant well height and back or side slagging probably affords the best means of obtaining carbons constantly within a narrow range (± 0.05 per cent total carbon). Where intermittent tapping is employed, variations in the elapsed time between taps must be controlled to within ± 30 sec if uniform carbon contents are to be maintained.

Controlling Carbon Content

Slagging should be accomplished between each tap. The amount of metal retained in the well has a bearing on the resulting carbon and, in general, the greater this amount or the deeper the well, the higher will be the carbon level. For a lower level of total carbon the front-slagging continuous-tap spout is generally used.

All other things being equal, in general an increase in blast will tend to decrease the carbon content, and a decrease in blast will increase the carbon content. Shutdowns, whether planned or emergency, constitute the most serious variable in operation with which a cupola operator has to contend in controlling carbon. It is also difficult to maintain temperature when unforeseen shutdowns become too frequent; when these are anticipated additional coke can be added in time to replenish the bed.

After the molten metal emerges from the cupola little can be done to change the carbon content or improve the temperature. Since it requires from 20 to 60 min for any correction made at the charging door to manifest itself at the tap hole, one readily realizes the importance of careful control at all times during the cupola run.

No single instrument or group of instruments will insure the furnishing of a sufficient quantity of iron at the proper temperature and desired carbon content. However, by coordinating the readings of the weighing, metering, and testing devices available with the laws of chemistry, physics, and thermodynamics entering into the processing, a uniform product can be consistently produced.

For measuring temperatures one should have a pyrometer properly calibrated for the iron being produced. Readings should be made at stated intervals and recorded for comparisons of daily results.

Estimate Carbon by Chill Test

In most foundries it is not possible to check the carbon content of molten metal by chemical means before pouring because of the time involved and consequent heat losses before delivering the metal to the mold for pouring. We do have fairly rapid means of determining whether the metal is suitable for the castings in question. If we assume that the metal has been controlled within specified limits with respect to silicon and other variables, then carbon can be estimated with fair accuracy by the depth of the chill obtained in the chill test.

In general, as carbon and silicon levels decrease, chill depth increases.[5] With practice, reasonably accurate estimates of analysis variations can be made from the chill depth and the structure of the fractured chill specimen. The A.F.S. has a Chill Test Committee which is endeavoring to standardize chill forms and methods, particularly for reference purposes.

Chill Control Methods

The control of chill by ladle addition is a rather simple matter in that the addition of ferrosilicon or one of the many other graphitizers will effectively reduce chilling tendency, while ferrochrome or other chill-increasing elements can be used to increase chill depth to desired level. By such additions the effects of minor variations in analysis from the desired mean can be minimized.

Irons have a tendency to "undercool" and to produce dendritic or "undercooled" structures which result in lower levels of strength and wear resistance than are obtained where normal structures are achieved. (For illustrations of these types of structures consult ASTM 247-41T or A.F.S. Cast Metals Handbook). This tendency is a function of analysis and melting conditions, as lower total carbons and operation under more oxidizing conditions tends to produce greater tendencies toward undercooled or dendritic structures.[6]

It has been found that the late addition of ferrosilicon or any one of several proprietary materials to the molten metal tends to result in the formation of normal graphite patterns. The duration of the effect of such an addition is normally sufficient to allow for pouring the metal and appears to be partially dependent on the addition material used. The amounts of inoculant used should be carefully controlled.

The fluidity test spiral[7] is frequently used to determine the acceptability of an iron for a specific job, or as part of the normal control measures. Precautions must be taken to pour this test at a specified temperature and under uniform pouring conditions. The length of the spiral as measured by the reference marks is used as an indication of fluidity.

Skilled Pouring Required

We now have quality controlled metal at the pouring station ready for pouring into quality controlled molds. At this point the mold with its cores and the metal from the ladle unite to create a salable casting, but if control has gone wrong along one of the routes to this point a scrap casting usually results. The actual pouring operation requires skill and close supervision. The pouring man must fill the pouring basin almost instantaneously, or the gating system cannot perform the functions for which it was intended.

In the author's opinion, pouring is one of the most important operations in the foundry, and one that is too frequently overlooked in quality control. Slag inclusions in a properly gated casting can only occur through faulty pouring. Gating, risering, pouring temperatures, and pouring rates as they affect the quality of a casting were mentioned earlier.

After a mold has been filled with molten iron many

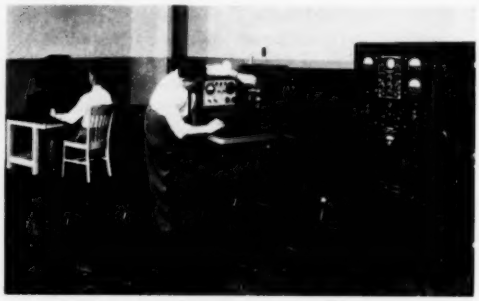
physical changes take place during the periods of freezing and cooling to room temperature. Some castings, because of inherent design, may be prone to crack if precautions are not taken to either expedite or retard the cooling rates of specific sections[8] (p. 174, reference 8).

Casting Treatment and Shakeout

In production work experience soon designates the particular treatment required and the length of time necessary in the mold before shaking out. If castings are shaken out too hot or above the critical temperature, air hardening may be encountered. When this is not desired, some control should be established to allow slow cooling through the critical temperature.

The shakeout operation is also critical with respect to cracking and casting breakage. Whether done by hand or by mechanical equipment, constant control is required.

The various means of cleaning castings such as tumbling, blasting (either dry or wet), chipping,



Spectrographic analysis of metals is performed with this equipment in the metallurgical research laboratories of the International Harvester Co., Chicago, Ill.

grinding, or filing should be under quality control because these operations influence final appearance. While it can be argued that appearance has nothing to do with functional properties in most cases, nevertheless it plays a major part in customer relations. Some classes of castings such as enamelware require special surface treatments, which necessarily must be closely controlled. Quality standards for cleanliness and surface appearance should be agreed upon with the customer and maintained.

E. C. Osborne[9] proposed a definition for inspection which seems appropriate for this discussion: "Inspection is the art of critical examination by means of standards of comparison, which are actual or theoretical, for the purpose of judging the value of the part in question for use in its particular place."

Dimensional tolerances can be checked by suitable measuring instruments, but in order to be certain of the relationship of one dimension to another a surface plate with sufficient equipment should be available to the foundry and used often enough to make sure that all parts of the casting are within specified limits. Inspection gages should be provided for particular dimensions and checked regularly.

Visual inspection for casting defects is the most useful means which a foundryman has at his disposal, not only from the standpoint of reducing rejects by the customer, but more especially for improving the overall quality and percentage of good castings produced. This is true only when the inspector is trained in the causes of visual defects and can report intelligently back to the department responsible for the defect.

Of great assistance to those concerned in any way with castings is the book ANALYSIS OF CASTING DEFECTS published by A.F.S. Use of the chart on the "Outline of Causes of Gray Iron Casting Defects" is recommended, and the suggestion is made that the book could be used as a text book in training supervision, inspectors, and quality control men.

Non-Destructive Testing

The final step in the production of a quality controlled engineering gray iron casting is the application of non-destructive tests in order to determine whether it will meet the physical and mechanical properties specified by the designing engineer. These tests may be hydraulic if liquid pressures are involved, electrical for conductivity, or thermal for heat qualities. If tensile strength of the casting is required we must resort to a correlation of test bars poured at the same time as the casting.

Hardness determinations may be made on the casting and compared to previously correlated hardness-tensile relationship. Under the same conditions of melting and molding techniques, and with the same chemical analysis, there is a definite relationship between Brinell hardness and tensile strength, but unless all conditions are fairly uniform this relationship becomes a band rather than a line, as shown by the work of MacKenzie.[10]

If castings are sold on hardness specifications the particular place on the casting where hardness determinations are to be made should be agreed upon, and sufficient tests made to be certain that all the castings are within the specified limits. File testing is of value where critical sections are involved to insure freedom from chilled edges, and should be used regularly.

X-ray or gamma-ray examinations can be used to insure freedom from internal porosity and uniform density. This type of test has its maximum use in arriving at proper gating and risering techniques for new designs as they are put into production. Magnetic particle and fluorescent penetrant inspection are important methods of assuring freedom from cracks not readily visible, and are used for testing castings 100 per cent when specified. Spectrographic analysis affords a rapid means for control of chemical composition.

Quality Control by Destructive Testing

Destructive testing is that part of quality control usually carried out on test bars or on unsalable castings in mechanical and chemical laboratories. The standard ASTM Specification A 48-46 is the basis for all mechanical testing of gray iron. Many standardized tests used in the various branches of the gray iron industry are familiar to those in these branches, and no attempt is made to cover them in this paper.

The making, testing, and proposed correlations with casting sections of three sizes of test bars are detailed in ASTM Specification A 48-46. Other standard proce-

dures on methods of testing, recommended practices, and definitions found in ASTM *Standards* are:

A	43-45 T.	Foundry Pig Iron (tentative) p. 1054.
A	48-46	Gray Iron Castings, p. 593.
A	126-42	Gray Iron Castings for Valves, Flanges, and Pipe Fittings, p. 600.
A	190-44 T.	Gray Iron Castings, Light Weight and Thin-Sectioned (tentative), p. 1063.
A	159-44 T.	Gray Iron Castings, Automotive (tentative), p. 1070.
A	278-44 T.	Gray Iron Castings for Pressure-Containing Parts for Temperatures to 650 F (tentative), p. 1065.
A	44-41	Cast Iron Pit-Cast Pipe for Water or Other Liquids, p. 603.
A	74-42	Cast Iron Soil Pipe and Fittings, p. 617.
A	142-38	Cast Iron Culvert Pipe, p. 619.
A	256-46	Compression Testing of Cast Iron, p. 629.
E	15-39 T.	Radiographic Testing of Metal Castings (tentative), p. 1092.
E	30-45	Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron (see 1946 Chem. Anal. Metals).
A	247-41 T.	Graphite in Gray Iron, Evaluation of Microstructure (tentative) p. 1073.
A	260-42 T.	Torsion Tests of Cast Iron (tentative), p. 1081.
A	196-46 T.	Cast Iron, Terms Relating to (tentative), p. 1084.
E	52-45 T.	Industrial Radiographic Terminology for Use in Radiographic Inspection of Castings and Weldments (tentative), p. 1097.

In addition to ASTM standard tests, the many helpful tests described in the A.F.S. CAST METALS HANDBOOK are recommended to those interested in quality control procedures.

The daily use of unsalable castings for testing or dimensional checking cannot be overemphasized, for it is certain that only by an intelligent analysis of the already produced scrap can the causes of such scrap be determined and the sources eliminated. By sectioning or breaking scrap castings, one often foresees troubles other than the specific defect for which the casting was scrapped originally, and thereby forestalls future losses or borderline quality.

Mechanical properties in various sections of a casting can be correlated with control test bars and the necessary adjustments made to insure that production castings will meet specifications. It is recognized that these procedures are applicable only to quantity production items. Where only one casting is made from a pattern, we must rely upon the close control of all the factors and processes entering into the making of this casting.

Control Laboratories

Quality casting production cannot be guaranteed without the assistance of chemical, mechanical, and sand laboratories. Whether these are an integral part of the foundry, or commercial laboratories are to be used, becomes a problem in economics which must be solved in each case.

Modern laboratory equipment is so well cataloged that it does not appear necessary to list it here, but merely to point out that by using and concisely recording the results obtained for daily comparisons, one is able to evaluate progress and meet specifications more consistently. (Editor's Note: Articles on chemical and mechanical testing laboratories for gray iron foundries, with equipment details, will appear soon in AMERICAN FOUNDRYMAN.)

It would seem superfluous to devote attention to the subject of salvage or repair of defective castings in a discussion that is supposed to eliminate this necessity. When economics warrant, the repair of a minor defect by accepted methods should be permitted, and standard procedures for such repairs should be evolved. During the war the Society of Automotive Engineers appointed a committee whose function it was to draw up procedures for welding and repair of defective automotive gray iron castings. The committee report, entitled *Foundry Process Control Procedures*, is applicable to most gray iron castings and may be procured through the American Foundrymen's Society.

The magnetic particle method is employed for non-destructive testing of a sleeve casting at Frank Foundries Corp., Moline, Ill.

Summary

Quality control test procedures reflect themselves not only in the improved casting delivered to the customer but also in profits and increased output. The most expensive casting made in any foundry is a scrap casting, and the ultimate goal, of course, is to make them all good. It appears that the most certain way of approaching perfection is to establish standard procedures for each operation in a foundry, and maintaining these standards through constant testing and checking. Accurate recording or charting of daily achievements is the only means of determining whether the trend is away from or toward the goal.

References

1. J. T. Eash, and R. E. Smith, "Effect of Moisture and Preheat of the Cupola Blast on Gray Iron," A.F.S. TRANSACTIONS, vol. 49, pp. 1022-1052 (1941).

2. W. W. Levi, "Operation and Control of the Cupola," A.F.S. TRANSACTIONS, vol. 54, pp. 808-817 (1946).

3. D. J. Reese, "Cupola Operation," A.F.S. TRANSACTIONS, vol. 46, pp. 173-194 (1938).

4. J. A. Bowers, and J. T. MacKenzie, "Cast Iron as Affected by Coke Size in Cupola Melting," A.F.S. TRANSACTIONS, vol. 45, pp. 293-324 (1937).

5. W. H. Spencer, "Chilling Properties of Cast Iron," A.F.S. TRANSACTIONS, vol. 42, pp. 508-524 (1934).

6. J. T. Eash, "Effect of Ladle Inoculation on the Solidification of Gray Cast Iron," A.F.S. TRANSACTIONS, vol. 49, pp. 887-910 (1941).

7. F. Holtby and R. L. Dowdell, "Effects of Sulphur on Properties of Electric Furnace Cast Iron," A.F.S. TRANSACTIONS, vol. 48, pp. 303-346 (1940).

8. L. A. Danse, "A Scientific Approach to a Foundry Problem," A.F.S. TRANSACTIONS, vol. 47, pp. 147-178 (1939).

9. E. C. Osborne, "Minimum Inspection Equipment Necessary to Insure Castings Quality," AMERICAN FOUNDRYMAN, Dec., 1945, p. 69.

10. J. T. MacKenzie," The Brinell Hardness of Gray Cast Iron and Its Relation to Some Other Properties," ASTM *Proceedings*, vol. 46, pp. 1025-1038 (1946).

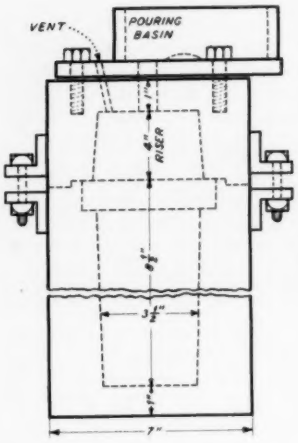
CASTING AND MACHINING PURE SILVER BOTTLES

W. C. Ellis
Superintendent
Kingsport Foundry & Mfg. Corp.
Kingsport, Tenn.

Fifty pure silver bottles were required for the transportation of a rare chemical substance—a product of atomic research operations. The bottle was designed with a flange at the top to accommodate a silver lined stainless steel cover, and finished dimensions were 2-in. ID, 8-in. depth, and ½-in. thickness.

Each casting was required to withstand a hydrostatic test of 700 psi. The inner surface was polished to a mirror finish—even the smallest pinhole or surface imperfection being cause for rejection. The outside surface was also polished, but to a lesser degree.

The foundry had had but little experience in casting silver and was somewhat at a loss as to a production method. Hurried inquiries to several silver producers disclosed but little information—all were engaged primarily in stamping or rolling operations and could offer no immediate advice on producing a casting of the size described.



Sketch showing construction details of three-part metal mold used for casting pure silver bottles.

The first attempt to cast the bottle was made in dry sand, with a cored hole to reduce machining in the bore. Several castings were poured, but each proved defective, some flaw causing rejection during machining or showing up under hydrostatic test. The defects encountered were pinholes with smooth walls, apparently the result of gas in the metal.

Silver tubing, which had been in service in a local industry and showed definite signs of contamination from some chemical, was melted for the first castings poured in dry sand. The difficulty encountered in the first trial castings was later traced to some chemical reaction in the contaminated metal rather than to pouring in dry sand. Ingot silver became available at this time, and no further effort was made to determine the cause of gas holes in the old metal.

Before ingot silver became available it had been decided to use a metal mold and metal core plug to cast the bottle. In this method the mold was preheated to approximately 800 F and the metal poured, but the castings were found to have laps or cold shuts where the metal came around the core plug. The core plug was then eliminated and a solid billet cast, with a riser to insure proper feeding. This method proved to be entirely satisfactory.

A graphite crucible in an oil-fired furnace was used to melt the silver under a cover of charcoal. The charcoal served to protect the metal from absorption of furnace gases, and no flux of any kind was necessary. The metal was poured at 1950 F. All shavings from machining, gates, and risers were carefully preserved and kept absolutely free from contamination by other metals, grease and oil. After the first few castings were made, about two thirds of each charge was remelted. Total loss in melting and handling was slightly under 0.3 per cent.

The metal mold was something of a problem at first, and was made in three parts as shown in the accompanying sketch—the lower half, the riser section, and the gate or runner box. In use, the mold was assembled and heated after first lightly oiling the inside surface. After pouring, the bolts holding the gate box and vent were loosened and the runner broken off while the metal was still hot short.

Sectioned Mold Eases Casting Removal

Allowed to cool to about 200 F, the casting was removed by loosening the bolts that held the mold sections together. Due to the draft of ¼ in. per ft provided on the body or lower section, and ¾ in. per ft on the upper section, it was an easy matter to slip the casting out of the mold. The oil used to coat the mold was a lightweight mineral oil, its only function being to prevent the molten silver from sticking to the mold.

In machining, it was found that the silver behaved much like soft steel screw stock, except that it was softer and more stringy and tended to tear easily. The castings were first rough turned and bored, and then finished—the final finish being obtained by using extremely fine body-paper and light oil. Before machining, each casting weighed 65 lb, and after machining, 18½ lb.

The first bottle was delivered in only 6 days from the time work started, 2 days having been lost as a result of the use of the contaminated silver tubing, and the entire order was completed 30 days later. This required around-the-clock work and the wholehearted interest and support of such of the plant personnel as were assigned to the project.

Can Cover West Coast In Fortnight

Eastern and mid-western speakers can now appear before each of the five West Coast chapters of A.F.S. in a period of only 15 days. Approval of directors of each of the chapters—Southern California, Northern California, Oregon, Washington, and British Columbia—has been given to a rescheduling of meetings to permit speakers to visit all chapters with a minimum time away from their plants and offices.

Questions and Answers — THE ROUND TABLE

Dielectric Gluing Not For Patterns

Do you know of any applications of high frequency heating in the construction of patterns? Do patternmakers use the "bag molding" process used for airplane parts and boat hulls made of veneer?

This system of fabrication is not applicable to patternmaking although it is useful where many wood parts of the same shape are required, such as boat hulls, rounded cabinets, etc. We make only one pattern to obtain many castings. It would take longer and cost more to make a form to "bag mold" the wood by the high frequency method than to make the wood shape itself.

Someday we may be gluing our boards and blocks by dielectric heating. Some of the large planing mills are gluing plywood doors, etc., by this method and find it very practical although the equipment is rather expensive.

V. J. Sedlon, *President*
Master Pattern Co.
Cleveland

Users of high frequency heating equipment and also the dealers advise that it is not practical for drying glued lumber having a thickness of more than one inch. We have been unable to locate any pattern shop using the equipment—most of them are using a water-type cold glue which dries rapidly.

The machines have worked out well in applying edge veneers and on core stock not over one inch thick. It is more practical to have the current penetrate along the glue lines rather than through the wood and on wide stock the time of penetration becomes excessive. Furthermore, it takes some time for an operator to accustom himself to the use of the machine. In the pattern trade where each man completes his own work it would mean training every employee to use the high frequency outfit.

Vaughan C. Reid, *Vice-President*
City Pattern Foundry & Machine Co.
Detroit

Graduating Seniors: See FEF

I should like a foundry job after graduating from Missouri School of Mines in January, 1950. Do you have a list of foundries interested in hiring engineering graduates?

American Foundrymen's Society does not have a record of foundries interested in graduate engineers although the National Office will refer you to prospective employers who may become known to us from time to time. For specific information on foundry openings for permanent work and summer jobs for engineering students and graduating seniors write to George K. Dreher, Executive Director, Foundry Educational Foundation, Terminal Tower, Cleveland 13, Ohio.

High Safety Factors Unnecessary

Our work in the Mechanical Design Department of the Corps of Engineers lately has consisted of designing gates for dams. The gates are of cast steel or cast iron and the lowest factor of safety on some of the parts is 20 to 25. Is it necessary to have such high factors of safety just because the metal is cast?

Today castings are supplied with the same assurance of quality as is given for metal products made by any other method of metal fabrication. With today's knowledge of casting technique and control of the product both in metallurgy and soundness, factors of safety beyond 5 or 6 are principally used to cover up unknown design stresses and factors.

Safety factors are used to allow for tied-up stresses in unannealed castings, and for a lack of understanding of moduli of elasticity, of expansivities, and of the stresses imposed on the part by service. Through annealing of castings and through a thorough understanding of the properties and the service, factors of safety should be used only to allow for the unusual service demands.

The A.F.S. Cast Metals Handbook, Charles W. Brigg's *Metallurgy of Steel Castings*, and the Steel Founders' Society's *Steel Castings Handbook* cover casting design very well and the principles stated apply to castings generally.

F. G. Sefing, *Res. Metallurgist*
International Nickel Co.
New York

Design engineers determine the allowable or working stress of a member by dividing the ultimate strength of the material by an arbitrary factor of safety. The safety factor is decreasing in importance since it is often misleading and because its need is falling off as a result of modern stress analysis methods and studies which permit more accurate design and more economical use of material.

If a factor of safety is to be used, the following possible service conditions must be evaluated before

a selection is made: (1) loads variable or steady; (2) loads alternately on and off; (3) stresses reversed; (4) repeated impacts; (5) corrosion; (6) uncertainty of strength of the material or amount of load; and (7) possible heavy property loss or loss of life in case of failure.

At times factors of safety of the order of 20 to 25 are used when the strength of the material or some of the service conditions are unknown In such cases the factor of safety is really a "factor of ignorance."

Investigations have shown that cast steels do not differ from wrought steels in their mechanical properties, response to heat treatment, and hardenability. The moduli of elasticity are the same. Wrought steels, of course, originate as cast steel and solidification occurs in an ingot mold rather than in a sand mold. The fundamental principles of solidification apply in each product.

The modern foundryman—applying his knowledge of controlled directional solidification, contraction phenomena, and controlled foundry techniques in molding and core making is able to produce sound castings. The integrity of these castings can be demonstrated through such non-destructive tests as magnetic particle and fluorescent penetrant inspection, radiography, and ultrasonic testing.

It is imperative that the designing engineer, the foundryman, and the patternmaker collaborate when a part is designed as a casting. In many instances in the past no consideration was given as to whether a design would lend itself to economical production of a good casting. Now it is recognized that the design of a casting must be functional as to its application and its production. And it is recognized that a properly designed casting will not only lend itself to the application of modern scientific foundry techniques but will also have a better stress distribution in service.

Clyde B. Jenni, *Metallurgist*
General Steel Castings Corp.
Eddystone, Pa.

Wants To Check Ladle Temperatures

We should like to have your recommendation as to the best type of instrument to use in checking the temperature of gray and white iron in the ladle.

The best type of instrument depends on how accurate the temperature measurements must be. The most accurate measurements are made with a platinum-10 per cent rhodium immersion thermocouple connected to a potentiometer. Such a thermocouple must be accurately calibrated and enclosed in a fused quartz primary protection tube customarily surrounded by a graphite protection tube.

The immersion pyrometer eliminates errors inherent in optical pyrometers which are affected by smoke, haze, surrounding illumination, and very seriously by slag and oxide films. The latter have a higher emissivity than clean molten iron and appear to be hotter though at the same temperature as the iron. This is complicated further because the emissivity is not constant but varies with the temperature.

The number of immersions which can be made on molten metal with such a thermocouple depends on the temperature of the metal, length of time immersed, and general care of the couple. The graphite is combustible and also dissolves in unsaturated alloys. Accordingly, it must be replaced at intervals to prevent failure and contact of the molten iron with the quartz tube. This might fail and cause destruction of the thermocouple.

An immersion thermocouple with a minimum "heating up" time which shortens the time required to make a reading was reported by W. A. Spindler in AMERICAN FOUNDRYMAN, April, 1947, page 125.

If you are interested in temperature measurements for control purposes only, reasonably accurate readings can be obtained with a disappearing filament type optical pyrometer. Such instruments are widely used and give satisfactory service provided their limitations as mentioned above are kept in mind.

Chapter Awards A.F.S. Membership To Outstanding Buffalo Tech Senior

A YEAR'S MEMBERSHIP in the American Foundrymen's Society was recently awarded Lloyd E. Schuster, top-ranking senior student in the Buffalo State Technical Institute's course for metallurgical technicians by the A.F.S. Western New York Chapter.

The award was made on first class day of the fall semester to Mr. Schuster, who was judged the outstanding student in a senior class of 323, of whom 34 are completing a two-year course in metallurgical technology. In the 24-month work-study course offered by the Institute, metallurgy technology students are required to complete two three-month periods of cooperative training in industry.

The Western New York Chapter has been instrumental in the establishment of the metallurgical technology course at the Buffalo State Technical Institute, which offers tuition-free technical training to New York high school graduates.

Otto V. Guenther, left, head of the Metallurgical Technology Department of the Buffalo State Technical Institute, and Institute Director Richard B. Dry, seated, look on as John R. Wark, right, Queen City Sand & Supply Co., Buffalo, chairman of the A.F.S. Western New York Chapter, presents a year's membership in the American Foundrymen's Society to Lloyd Schuster, top Metallurgical Technology student, Buffalo Institute.

Letters to the Editor

Letters to the Editor gives the foundry industry an open forum for the exchange of ideas, facts, opinions, and criticisms on anything related to the industry or of importance to foundrymen. All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to The Editor, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Letters must be signed but will be published anonymously on specific request.

How To Make The Most Of A.F.S. Membership

I read the item on page 26 of the August issue of AMERICAN FOUNDRYMAN about using one's membership by serving on a committee. Although a relatively new member of A.F.S., I should like to share in the important work being carried on.

RICHARD GLENCROSS, Met.
Hersey Mfg. Co.
South Boston, Mass.

It is a truism that you can't get something for nothing, or, expressed differently, that the return is in proportion to the investment. To increase the value of my return as a member of A.F.S. I enclose some facts regarding my experience for transmittal to the appropriate committee chairman.

JOSEPH J. WARGA, *Stds. Eng.*
Sperry Gyroscope Co.
Great Neck, N. Y.

Over 500 top-flight foundrymen, metallurgists, educators, designers, and castings users serving on more than 100 committees provide the technical leadership for the American Foundrymen's Society and for the foundry industry. —Editor.

Ideas On Coke Handling

The letters on coke handling by N. Harold Boardman and W. E. Illig on the *Letters to the Editor* page of the September issue of AMERICAN FOUNDRYMAN interest us very much. Our company has designed and installed a great many mechanical chargers and charge make-up systems, most of which employ a grab bucket for handling coke as mentioned in Mr. Boardman's letter.

We have been giving the problem of breakage of soft coke a great deal of consideration in designing new make-up units. This does not help foundries with units already installed, but the following suggestions are useful:

1. Buy coke the next size larger than needed for your cupolas.

2. Buy screened coke of uniform size with the breeze eliminated.

3. If possible, do not carry on hand any more coke than can be stored in your make-up bins. If coke has to be stored in the yard, this means double handling with the grab bucket

To prevent excessive breakage of coke several types of installations have been built or proposed:

1. Multiple storage bins and a travelling weigh lorry instead of a single bin and a stationary weigh hopper.

2. Track hopper for unloading the cars directly onto a belt conveyor which feeds directly into the bin, or into drop bottom buckets which in turn are used to load the bin.

3. Same as No. 2 but use a portable car unloader which feeds onto a belt conveyor.

The last two types of installations require that the coke come in hopper bottom cars at regular intervals.

The last word in handling coke seems to be the use of containers, but due to a lack of containers their general use is still in the future. Some people are now using them and seem to be fortunate enough to always have their coke delivered in this way

FRANK FONES, *Fdry. Equip. Div.*
Whiting Corporation
Harvey, Ill.

More On Magnesium Treatment Of Iron

The paper, "*Variables in Producing Nodular Graphite Cast Iron by Magnesium Treatment*," by G. E. Holdeman and J. C. H. Stearns of Dow Chemical Co. (AMERICAN FOUNDRYMAN, August, 1949, page 36), is very good, and it is hoped that these lines of investigation are being continued by the authors and that further information will be forthcoming. The photomicrographs are excellent, and the microradiograph is most interesting. This could be continued into the field of the electron microscope, and useful photographs obtained.

In general the writer agrees with most of the data given in the paper, but it is believed that possibly too much emphasis has been placed on reactivity alone of magnesium-bearing alloys. When the total cost of the resultant nodular iron, per ton of iron treated, is considered it will be found that the more reactive alloys of copper and nickel with magnesium are likely to give the lowest costs consistent with best results, especially when irons of higher sulphur content are treated.

Cost of treatment is of fundamental importance in commercial production, and from considerable experience it is known that the 50-50 copper-magnesium alloy addition can be handled successfully in the foundry with little trouble. Use of higher magnesium content alloys is, of course, advantageous since less copper or nickel is introduced into the iron.

Some objection may be taken to the reporting of magnesium recoveries as the percentage of magnesium added found as residual magnesium in the treated iron. Since the desulphurization effect of magnesium is potent and apparently unavoidable, the consumption of magnesium as a desulphurizer must be considered as part of the added magnesium usefully consumed. It is believed that recoveries should be accounted for as the total of the desulphurizing magnesium and the residual magnesium.

J. E. REHDER, *Foundry Engineer*
Canadian Bureau of Mines
Ottawa, Ont.

For more on Mr. Rehder's ideas on desulphurization by magnesium see his paper, "*Magnesium Additions and Desulphurization of Cast Irons*," *American Foundryman*, September, 1949, page 33. A coming issue of "The Foundrymen's *Own* Magazine" will include a picture story showing nodular and near-nodular graphite at low and high magnifications, photomicrographs made by polarized light, microradiographs, and photomicrographs made by electron diffraction. —Editor.

Metal Trade Association Re-Elects Top Officers

RE-ELECTED for a second term at the Golden Anniversary Convention of the National Metal Trades Association, held October 26-28 at the Palmer House, Chicago, were the Association's top three executives—*president*, Thomas J. Morton, Jr., head of the Hoosier Cardinal Corp., Evansville, Ind.; *first vice-president*, Joseph L. Kopf, president of Jabez Burns and Sons, Inc., New York; and *second vice-president and treasurer*, Philip M. Morgan, president of the Morgan Construction Co., Worcester, Mass. Five new members were elected to the Administrative Council of the Association.

Reading Foundrymen Hosts To Industrial Arts Teachers

INDUSTRIAL ARTS INSTRUCTORS from schools in Reading and Berks counties, Pa., were guests of the Reading Foundrymen's Association at its October 20 meeting.

More than 150 members and guests attending the opening meeting of the season heard D. W. Talbott and Frank Schumacher of the Cooper Alloy Foundry Co., Hillside, N. J., discuss "*Plastic Patterns*." Following their talk, the speakers demonstrated some of the methods used in making plastic patterns.

Association President Paul B. Harner, Union Mfg. Co., Inc., Boyerton, Pa., Reading, appointed William Davies, Reading Foundry & Supply Co., Reading; Werner Finster, Textile Machine Works, Foundry Division, Reading; and Charles Mundell as members of the Nominating Committee.

Chapter Officers AFS and Directors

S. L. Cameron, Jr.
Valley Iron Works, Inc.
St. Paul, Minn.
Vice-Chairman
Twin City Chapter

G. E. Smith
East Texas Elec. Steel Co.
Longview, Texas
Director
Texas Chapter

Arnold Boscacci
American Brass & Iron Foundry
Oakland, Calif.
Director
Northern California Chapter

W. B. Coleman
W. B. Coleman & Co.
Philadelphia
Secretary-Treasurer
Philadelphia Chapter

C. P. Caldwell
Caldwell Foundry & Machine Co.
Birmingham, Ala.
Chairman
Birmingham District Chapter

D. Polderman, Jr.
Whiting Corp.
New York
Treasurer
Metropolitan Chapter

Alan G. Linley
Locomotive Finished Material Co.
Atchison, Kans.
Director
Mo-Kan Chapter

Earl M. Strick
Erie Malleable Iron Co.
Erie, Pa.
Secretary
N. W. Pennsylvania Chapter

G. M. Cover
Case Institute of Technology
Cleveland
Director
Northeastern Ohio Chapter

Donald H. Rishor
G. F. Pettinos, Inc.
Rochester, N. Y.
Director
Rochester Chapter

John G. Blake
Alloys Founders, Inc.
Toledo, Ohio
Director
Toledo Chapter

F. W. Thayer
Gunite Foundries Corp.
Rockford, Ill.
Vice-Chairman
No. Ill.-So. Wis. Chapter

New AFS MEMBERS

NEW SUSTAINING MEMBERS

Bardes Forge & Fdy. Co., Cincinnati, Ohio—Oliver L. Bardes, Pres. (Cincinnati Chapter)—Conversion from Company.

Christiansen Corp., Chicago, Ill.—Edward S. Christiansen, Pres. (Chicago Chapter)—Conversion from Company.

Nassau Smelting & Refining Co., Rosedale, N. Y.—C. P. Crotty, Sls. Repr. (Eastern New York Chapter)—Conversion from Company.

The Pyro Refractories Co., Oak Hill, Ohio—O. E. Miller, (Central Ohio Chapter)—Conversion from Company.

NEW COMPANY MEMBERS

American Brass & Iron Fdy., Oakland, Calif.—Arnold Boscacci, Owner (Northern California Chapter)—Conversion from Personal.

Automotive Pattern Co., Detroit, Mich.—Fred Londal, Partner. (Detroit Chapter).

Canadian Unit Cast Steel Ltd., Sherbrooke, P. Q., Canada—L. N. McEntush, Gen. Wks. Mgr. (Eastern Canada Chapter).

M. Cockburn & Co., Ltd., Falkirk, Scotland—R. L. Hunter, Managing Dir.

J. H. Connor & Son, Ltd., Ottawa, Ont., Canada—George Fox, Supt. (Eastern Canada Chapter).

Fahralloy Company, Harvey, Ill.—J. M. Blake (Chicago Chapter)—Conversion from Personal.

Flockhart Foundry Co., Newark, N. J.—Robert E. Moore, Pres. (Metropolitan Chapter).

Glauber Brass, Inc. Kinsman, Ohio—Eldon McCarty, Plt. Supt. (Northeastern Ohio Chapter).

BIRMINGHAM CHAPTER

Harold M. Gade, Asst. Prof., College of Engrg. University of Alabama, University, Ala.
Edwin E. Pollard, Chief Engr., Alabama Pipe Co., Anniston, Ala.

CENTRAL ILLINOIS CHAPTER

George L. Martin, Casting Buyer, Caterpillar Tractor Co., Pekin, Ill.
John F. McGrath, Asst. Buyer, Caterpillar Tractor Co., E. Peoria, Ill.
Bruce H. Norman, Black Products Co., Chicago.

CENTRAL INDIANA CHAPTER

Jerry Huenefeld, Mgr. Ref. Div., Spickelmier Co., Indianapolis, Ind.
Jack D. Sickmann, Supv., Swayne Robinson & Co., Richmond, Ind.

CENTRAL MICHIGAN CHAPTER

Walter C. Schneider, Engr. Chg. of Pattn. Equip., Motor Wheel Corp., Lansing, Mich.

CENTRAL NEW YORK CHAPTER

Edward G. Cahill, Res. Slsmn., Aluminum Co. of America, Syracuse, N. Y.

CHESAPEAKE CHAPTER

Barry H. Fisher, Slsmn., U. S. Graphite Co. Div., The Wickes Corp., Saginaw, Mich.

CINCINNATI CHAPTER

Lester Bashford, Night Supt., GHR Fdy., Dayton Malleable Iron Co., Dayton, Ohio.
Donald B. Fulton, Ind. Engineer, GHR Fdy., Dayton Malleable Iron Co., Dayton, Ohio.
Arnold J. Grossman, Engr. in Training, Dayton Malleable Iron Co., Dayton, Ohio.
H. L. Leonard, Asst. Supt., GHR Fdy., Dayton Malleable Iron Co., Dayton, Ohio.
W. B. Moore, Tech. Ser. Engr., Reynolds Metals Co., Louisville, Ky.
F. A. Osterman, Fdy. Supt., International Harvester Co., Louisville, Ky.
Kenneth R. Partington, Mech. Engr., GHR Fdy., Dayton Malleable Iron Co., Dayton, Ohio.
Robert F. Rush, Plt. Mgr., Dayton Malleable Iron Co., Dayton, Ohio.
Harold C. Spohn, Student, University of Cincinnati, Cincinnati, Ohio.
Hugh Donald Stork, Fmn., GHR Fdy., Dayton Malleable Iron Co., Dayton, Ohio.

DETROIT CHAPTER

Automotive Pattern Co., Detroit, Mich.—Fred Londal, Partner.
Joseph C. Friedel, Sr., Cost Analyst—Prod. Fdy., Ford Motor Co., Detroit.
Oscar F. Kolberg, Partner, Automotive Pattern Co., Detroit, Mich.
Ray Treon, Jr., Met., Dodge Fdy., Chrysler Corp., Hamtramck, Mich.

EASTERN CANADA CHAPTER

George Barrett, Stl. Fdy. Fmn., Dominion Engrg. Works Ltd., Montreal, Que., Canada.
Jean Marie Beaudry, Sand Lab., Warden King Ltd., Montreal, Que., Canada.
K. W. Campbell, Mech. Supt., Aluminum Co. of Canada Ltd., Arvida, Que., Canada.
Douglas Cameron Crawford, Appr. Molder, Montreal Bronze Ltd., Montreal, Que., Canada.
Canadian Unit Cast Steel Ltd., Sherbrooke, P. Q., Canada—L. N. McEntush, Gen. Wks. Mgr.
J. H. Connor & Son, Ltd., Ottawa, Ont., Canada—George Fox, Supt.
Gilbert Dandoy, Appr. Molder, Montreal Bronze Ltd., Montreal, Que., Canada.
Aurele Desjardins, Supt., Brass Fdy., J. H. Connor & Son Ltd., Ottawa, Ont., Canada.
Alex Finseth, Supt., Iron Fdy., J. H. Connor & Son Ltd., Ottawa, Ont., Canada.
Gilles Miron, Appr. Molder, Montreal Bronze Ltd., Montreal, Que., Canada.
William Arthur Newcombe, Slsmn., A. C. Leslie & Co. Ltd., Montreal, Que., Canada.
Niels B. J. Pedersen, Fmn., Dominion Engrg. Works, Lachine, Que., Canada.
Paul Pruneau, Draughtsman, Warden King Ltd., Montreal, Que., Canada.

METROPOLITAN CHAPTER

Roy T. Diffenbaugh, Consulting Mgnm. Engr., Roy T. Diffenbaugh, Cooperstown, Pa.
Flockhart Foundry Co., Newark, N. J., Robert E. Moore, Pres.
John P. O'Neill, Vice-Pres., Flockhart Foundry Co., Newark, N. J.

MEXICO CITY CHAPTER

Armando Arriola Ortega, Engr., Steel Cstg. Div., La Consolidada, S. A., Mexico City.
Reihard Otto Schaefer, Fdy. Supt., La Consolidada, S. A., Mexico City.
Robert Tapia Tellez, Met., Fundiciones de Hierro y Acero, S. A., Coloniahanahuac, Mexico.
Manuel O. de la Torre, Div. de Fundiciones, La Consolidada, S. A., Mexico, D. F., Mexico.
Luis Delgado-Vega, Casco, S. De R. L., Mexico, D. F., Mexico.

MICHIANA CHAPTER

Robert H. Greenlee, Met., Auto Specialties Mfg. Co., St. Joseph, Mich.
John M. Hager, Owner & Mgr., Columbia Casting Co., South Bend, Ind.
Lewis E. Heist, Fdy. Supt., Elkhart Brass Mfg. Co., Elkhart, Ind.
Wm. E. Patterson, Elkhart Fdy. & Mach., Elkhart, Ind.
Henry Vandermolen, Gen. Supt., Fay Fdy. & Machine Co., St. Joseph, Mich.

MO-KAN CHAPTER

Charley V. Grife, Fmn., Witte Engine Wks., Oil Well Supply Co., Kansas City, Mo.

NORTHEASTERN OHIO CHAPTER

Fredrick Franz Awig, Student, Case Institute of Technology, Cleveland.
Glauber Brass, Inc., Kinsman, Ohio, Eldon McCarty, Plt. Supt.
W. H. Huskonen, Pattn. Rm. Fmn., Glauber Brass, Inc., Kinsman, Ohio.
Henry Kopoczewiski, Student, Case Institute of Technology, Cleveland.
Harry M. Laws, Gen. Mgr., Lake City Malleable Co., Inc., Ashtabula, Ohio.
L. R. Massman, Fdy. Supt., Youngstown Fdy. & Mach. Co., Youngstown, Ohio.
Edward B. Purcell, Mgr., Roll Dept., Youngstown Fdy. & Mach. Co., Youngstown, Ohio.
Robert Evans Spear, Res. Engr., Aluminum Co. of America, Cleveland.

NORTHERN CALIFORNIA CHAPTER

Burt P. Christensen, Slsmn, Laclede-Christy Co., San Francisco.
L. N. Gushard, Ind. Engr., U. S. Gov., Dept. of the Army, ESS-GHQ-SCAP, San Francisco.
Thomas Scaparro, H. C. Macauley Fdy. Co., Berkeley, Calif.

NORTHWESTERN PENNSYLVANIA CHAPTER

R. W. Dahlquist, Plt. Supt., Griswold Mfg. Co., Erie, Pa.
John P. Finch, Spec. Assign. General Electric Co., Erie, Pa.

ONTARIO CHAPTER

Alex Hodges, Supt., Galt Brass Co. Ltd., Galt, Ont., Canada.

PHILADELPHIA CHAPTER

Frank M. Detwiler, Sls. Engr., Swan-Finch Oil Corp., New York.
Emmanuel X. Enderlein, V. P., H. G. Enderlein Co., Philadelphia.
Wm. H. Huber, Pattn-Shop-Fmn., Dodge Steel Co., Philadelphia.
Theo. W. Schwertzler, Fmn., Dodge Steel Co., Philadelphia.
David M. Warren, Jr., Sls. Engr., Eastern Fdy. Supplies, Inc., Irvington, N. J.
William Whartenby, Fdy. Fmn., Dodge Steel Co., Philadelphia.

QUAD CITY CHAPTER

Sam Carter, Dist. Sls. Mgr., A. P. Green Fire Brick Co., Moline, Ill.
Frank Rasko, Asst. Gen. Fdy. Fmn., Chge. Flr. Mldg. & Fdy. Labor, U.M.I.W., Deere & Co., Moline, Ill.

SAGINAW VALLEY CHAPTER

Leslie J. Benford, Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Roumaine Boughner, Fmn., Cupola Dept., Chev. G. I. Fdy., G.M.C., Saginaw, Mich.
Leon F. Corp, Chief Insp., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Arnold Gruetzmagher, Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Orville J. McKay, Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Ralph F. Mesack, Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Herman Miller, Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
George B. Toskey, Jr., Supv., Central Fdy. Div., G.M.C., Saginaw Malleable Plt., Saginaw, Mich.
Robert E. Wallace, Fmn., Core Dept., Chevrolet Grey Iron Foundry, G.M.C., Saginaw, Mich.
Gordon S. White, Plt. Personnel Div., Central Fdy. Div., G.M.C., Saginaw Malleable Iron Plt., Saginaw, Mich.

ST. LOUIS CHAPTER

Sam Gilley, Core Room Foreman, Key Co., E. St. Louis, Ill.
O. P. Huegerich, American Brake Shoe Co., American Manganese Steel Div., St. Louis.
William Paul Morton, Pattn. Shop Fmn., Key Co., E. St. Louis, Ill.
Henry C. Riedle, Fdy. Fmn., Koppers Co., Inc., Mo. Ill. Plt., Granite City, Ill.
H. Shoults, American Brake Shoe Co., St. Louis.
R. Wray, Sr., American Manganese Steel Div., American Brake Shoe Co., St. Louis.

SOUTHERN CALIFORNIA CHAPTER

Claude H. Allen, Chief Engr. & Gen. Supt., Industrial Oven & Equip. Co., Los Angeles.
M. C. Gleason, Rich Manufacturing Co. of California, Los Angeles.
Harold L. Overman, Sls. Engr., Whiting Corp., Los Angeles.
Charles Tuigler, Slsmn., Independent Fdy. Supply Co., Los Angeles.
Frank C. Warga, Fmn. Fdy., Airesearch Mfg. Co., Los Angeles.

TENNESSEE CHAPTER

William C. Marlin, Partner, Lewisburg Casting Co., Lewisburg, Tenn.
Chester W. Miller, Fdy. Supt., Moccasin Bushing Co., Chattanooga, Tenn.
Carl W. O'Neal, Partner, Lewisburg Casting Co., Lewisburg, Tenn.
B. F. Taylor, Pres. & Gen. Mgr., Cowan Stone Co., Cowan, Tenn.
L. E. Weaver, Partner, Lewisburg Casting Co., Lewisburg, Tenn.

TEXAS CHAPTER

O. M. Bartholomew, Fdy. Tech., Hughes Tool Co., Houston, Texas.
J. H. Cupp, Supt., Refinery Castings Co., Dallas, Texas.

TRI-STATE CHAPTER

Paul L. Losse, Section Head, Insulation Sec. Res. Dept., The Eagle-Picher Co., Joplin, Mo.

TWIN CITY CHAPTER

Joseph Garber, Fdy. Fmn., J. F. Quest Fdy. Co., Minneapolis.
John A. Holmen, Fdy. Sls., Cities Service Oil Co., St. Paul.
Richard Larson, Sls. Engr., Foundry Supply Co., Minneapolis.
Melbourne S. Monitor, Pattn. Storage, American Hoist & Derrick Co., St. Paul.

WASHINGTON CHAPTER

Irving J. Feinberg, Met., Puget Sound Naval Shipyard, Bremerton, Wash.
R. G. Prichard, Pattn. Fmn., Atlas Foundry, Tacoma, Wash.

WESTERN MICHIGAN CHAPTER

Ferris W. Billingsley, Supv., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Harry Boelkins, Gen. Fmn., Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Larry Brzycki, Insp. Dept., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Marion Z. Czarniecki, Supv., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Kenneth Evans, Fdy. Supt., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Charles S. Flynn, Combustion Engr., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Richard Hansen, Supv., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Ward D. MacDonald, Slsmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Edward A. Marks, Supv., Lakey Fdy. & Mach. Co., Muskegon, Mich.
Gustave T. Sondeen, Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Arthur G. Workman, Supv., Lakey Fdy. & Mach. Co., Muskegon, Mich.

WISCONSIN CHAPTER

Robert Bemm, Spring City Div., Grede Foundries, Inc., Milwaukee.
James Bird, Asst. Wks. Mgr., Grede Foundries, Inc., Milwaukee.
Arthur Cain, Maint. Supv., Grede Foundries, Inc., Milwaukee.
George Gunderson, Trainee, Milwaukee Steel Div., Grede Foundries, Inc., Milwaukee.
Roger Haberman, Slsmn., Grede Foundries, Inc., Milwaukee.
Wm. S. Hansen, Ind. Management, William S. Hansen, Milwaukee.
John Harris Chief Insp., Spring City Div., Grede Foundries, Inc., Milwaukee.
Elmer Higgins, Employment Mgr., Milwaukee Steel Div., Grede Foundries, Inc., Milwaukee.
Howard Koentop, Shipping Clerk, Spring City Div., Grede Foundries, Inc., Milwaukee.
Robert G. Rice, Pres., Milwaukee Chaplet & Mfg. Co., Milwaukee.
Ignatz Wallner, Maint. Fmn., Milwaukee Stl. Div., Grede Foundries, Inc., Milwaukee.

STUDENT CHAPTERS

MISSOURI SCHOOL OF MINES

Robert N. Brown — Robert F. Gurnea

OUTSIDE OF CHAPTER

Wylie J. Childs, Assoc. Prof., Lafayette College, Dept. of Mining & Met. Engrg., Easton, Pa.
Herman F. Eilers, Jr., Met. & Fdy. Mgr., Corning Glass Works, Charleroi, Pa.
M. A. Gratton, Asst. Prof., Met. Engr. Dept., Univ. of Pittsburgh, Pittsburgh.

Belgium

James Picanol Camps, Vice-Pres. Chg. of Res., Metiers Automatiques "Picanol" S. A., Belgium.

England

Ronald Laroux Handley, Ferranti Ltd., Hollinwood, Lancs., England.
G. S. Stevens, Allies Iron (R.W.) Ltd., Shropshire, England.
Hector A. Wainwright, "Fentham", Warwickshire, England.
A. Young, British Bath Co., Ltd., Greenford, Middlesex, England.

France

Albert M. Rey, Dir., Tanins Rey S. A., Suresnes Seine, France.

India

L. N. Vyas, Fdy. Appr., Jodhpur Railway Workshop, Jodhpur, India.

Norway

Torolf Krogvig, Chief Engr., Statens Teknologiske Institutt, Akersveien, Oslo, Norway.

Scotland

M. Cockburn & Co., Ltd., Gowanbank Iron Works, Falkirk, Scotland—R. L. Hunter, Managing Dir.

South America

Walter E. McAfee, Dev. Engr., Cia Lidgerwood Industrial, Santo Andree Brazil, S. A.
Metalurgica Wallig S. A., Porto-Alegre-R. G. Sul, Brazil, S. A.

Sweden

Ake Johnson, Fabrikor, Aktiebolaget Johnson-Verken, Orebro, Sweden.

URGENTLY NEEDED

VOLUME 56 (1948) TRANSACTIONS

Bound copies of this volume in good condition will be purchased by A.F.S. Headquarters. Members who have no further use for their copies are urged to write The Secretary, American Foundrymen's Society, 222 W. Adams, Chicago, 6.

WHO'S WHO

W. C. Ellis

William C. Ellis, author of *"Casting and Machining Pure Silver Bottles,"* Page 60, is general superintendent for the Kingsport Foundry & Mfg. Corp., Kingsport, Tenn. . . . Born January 9, 1902, in Memphis, Mr. Ellis attended grade and high school in that city and later took International Correspondence Schools courses . . . In 1924, Mr. Ellis joined the Vulcan Iron Works, Memphis, remaining there until 1933, when he was appointed Machine Shop superintendent for the Kingsport Foundry & Mfg. Corp. . . . In 1939, Mr. Ellis became plant superintendent for the Joy Mfg. Co., Franklin, Pa., returning in 1940 to Kingsport Foundry & Mfg. Co., in his present position as general superintendent.

H. A. Burton

H. A. Burton, author of *"Modern Foundry Methods—Engineering Metal Pattern Equipment,"* Page 48, is superintendent of the Metal Pattern & Gage Shop of Canadian Car & Foundry Co., Ltd.'s Steel Foundry Division, Montreal . . . Mr. Burton served his apprenticeship with the Montreal Locomotive Works, Ltd., and has also worked with the Northern Electric Co., Ltd., and in the tool service of the Bryant Detective Service, Philadelphia . . . Mr. Burton has had a wide range of experience in machine work, tools and gages, electrical installations and steam plants . . . He has been superintendent of Canadian Car & Foundry's Metal Pattern & Gage Shop since shortly after the war.

G. E. Bellew

George E. Bellew, author of *"Oxygen Injections Applied to Steel Melting,"* Page 24, is steel mill specialist for the Technical Sales Div., Air Reduction Co., New York . . . Prior to joining Air Reduction, Mr. Bellew, who was educated in metallurgy and chemistry, was associated with one of the largest steel companies as assistant chief inspector and in the company's metallurgical laboratory . . . Mr. Bellew has for nine years specialized in steel mill technical engineering activities, including furtherance of applications of oxy-acetylene processes to production methods . . . His efforts have been concentrated on riser cutting, flame machining, scarfing, gouging, and the flux-injection method of stainless steel cutting.

F. J. Walls

Fred J. Walls, author of *"Quality Control Review—Test Procedures for Quality Control of Gray Iron Castings,"* Page 51, is a Past National President of the American Foundrymen's Society (1945) . . . Born in Oakland County, Mich., Mr. Walls, attended the University of Michigan where he specialized in metallurgy . . . Shortly after receiving his degree, he joined the Wilson Foundry & Machine Co., Pontiac, Mich., and rose to chief metallurgist . . . After a brief period as metallurgist for the Eaton-Erb Foundry Co., Vassar, Mich., Mr. Walls joined the International Nickel Co., New York, in 1935, where he is today metallurgist and manager of the company's Detroit office . . . A Past National Director and President of A.F.S., Mr. Walls has been active for many years in committee work . . . He is today a member of the Gray Iron Division's Executive Committee and the Educational Division's Youth Encouragement Committee . . . He is a past director and president of the A.F.S. Detroit Chapter.

G. K. Dreher

George K. Dreher, author of *"How FEF Policies Affect Students, Universities and Industry,"* Page 38, is executive director of the Foundry Educational Foundation . . . A Past National Director of the American Foundrymen's Society, Mr. Dreher has for many years been active in A.F.S. committees, particularly in the educational field, where he has been instrumental in furthering the cause of better foundry education in engineering schools and colleges. . . . A graduate of Lawrence College, Appleton, Wis., Mr. Dreher joined Ampco Metal, Inc., Milwaukee, in 1930, becoming vice-president of that organization by 1946, when he was appointed vice-president and general manager of Rogers Pattern & Foundry Co., Los Angeles . . . In 1947, he was appointed the first executive director of FEF . . . In addition to his many other A.F.S. activities, Mr. Dreher is a past chairman of the A.F.S. Wisconsin Chapter.

Theodore F. Hatch, author of *"Planned Foundry Dust Control,"* Page 33, is professor of Industrial Health Engineering at the University of Pittsburgh and is a Past National President of the American Industrial Hygiene Association . . . Holder of a degree in civil engineering from the University of Maine (1924) and a degree in sanitary engineering from Harvard University (1925), Mr. Hatch has been engaged in industrial hygiene work for the Tennessee Health Dept., Harvard University, the New York Labor Dept., and the University of Pennsylvania . . . Following three years spent at Fort Knox, Ky., during the war as a Lieutenant Colonel, Mr. Hatch was appointed resident director for the Industrial Hygiene Foundation, Pittsburgh, assuming his present position at the University of Pittsburgh in 1947.

A. W. Gregg

Alfred W. Gregg, author of *"1949 International Foundry Congress,"* Page 28, recently returned from Amsterdam, where he was official A.F.S. delegate to the Congress, and where he presented the official A.F.S. paper, *"Ferrous Melting Furnaces in the United States and Canada"* (AMERICAN FOUNDRYMAN, October, 1949, Pages 27-32) . . . An A.F.S. John H. Whiting Gold Medalist (1944), Mr Gregg is chairman of the A.F.S. Educational Division and vice-chairman of the Chicago Chapter . . . Holder of a B.S. (1903) and an M.S. (1904) from Purdue University, Mr. Gregg was first employed as metallurgist for the Latrobe Steel Co., Melrose Park, Ill., in 1904. He was for 15 years foundry superintendent for the Bucyrus-Erie Corp., South Milwaukee, Wis., and for seven years superintendent of the Bonney-Floyd Co. plant at Columbus, Ohio. . . . Mr. Gregg joined the Whiting Corp. as executive engineer in the company's Foundry Equipment Dept. and is today consulting engineer for that firm.

FOUNDRY *Personalities*

Norman A. Malone, general manager of the Sheffield Iron & Steel Co., has been appointed vice-president and general manager of the Canton, Ohio, plant of the Barium Steel Corp., parent company of Sheffield Iron & Steel.

William E. Mahin, director of research at the Armour Research Foundation of

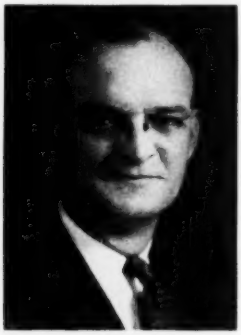
W. E. Mahin

the Illinois Institute of Technology, has been named to represent the American Society for Metals for a three-year period on the National Research Council. Mr. Mahin became director of research at the Foundation recently after serving three years as head of the Metals Research department of the Foundation.

Several Ohio State University September graduates newly-employed by various Ohio foundries are: **Bruce Burkett** and **Eldon Boner,** with the Central Foundry Division of General Motors Corp. at Defiance; **Edgar Sampson, Wilkerson Howard** and **Richard Riley,** with the Dayton Malleable Iron Co., Dayton; and **Maurice Schenck,** with the G.H.R. Div., Dayton Malleable Iron Co., Dayton. **Charles W. Keith,** a June graduate and a member of the A.F.S. Student Chapter at the University, has taken a position teaching foundry in Lansing, Mich., public schools.

A. J. Edgar, formerly with the Benton Harbor Malleable Iron Co., Benton Harbor, Mich., has been appoined general manager of the Hunt-Spiller Mfg. Co., Boston. Prior to joining Benton Harbor Malleable Mr. Edgar was co-manager and technical director of the Gray Iron Founders' Society, with offices in Washington, D. C., where he served Army and Navy procurement offices in the allocation of castings for military use.

Norman F. Hindle, Technical Director of the American Foundrymen's Society from 1944 to 1947 and who left to accept an associate professorship in the University of Idaho's Mechanical Engineering department, was recently appointed a full professor and head of the University's Mechanical Engineering department. Beginning as an A.F.S. Staff Assistant in 1933, Mr. Hindle became, successively, Assistant Technical Secretary, Technical Secretary and Assistant Secretary. In 1944, he was appointed Director of the newly-



N. F. Hindle

formed A.F.S. Technical Development Program, encompassing all technical activities of A.F.S. Prior to joining A.F.S., Mr. Hindle was employed by American Steel Foundries and the Penton Publishing Co., Cleveland.

Earl M. Strick, secretary of the Northwestern Pennsylvania Chapter, and finishing superintendent of Erie Malleable Iron Co., is believed to have set some kind of record for public speaking in Erie, Pa. A student of foundry history of the Erie area, he has given talks on early foundry industry activities before many of Erie's civic groups and service clubs, as well as before the A.F.S. chapter there. He is a co-organizer of the Northwestern Pennsylvania Chapter and served as its second chairman in 1946-47.

George W. Altman has been named to succeed **E. W. Longacre,** who recently retired as manager of the Trenton, N. J., cast iron foundry of the National Radiator Co. Mr. Altman, who joined National Radiator this year as a foundry engineer, was previously general manager of Bridgman Castings, Inc., Bridgman, Mich., and prior to that was with the Lennox Furnace Co., Columbus, Ohio, and the Pittsburgh Coke & Iron Co., Pittsburgh. Mr. Longacre retired after serving National Radiator since 1914, when he joined as a master patternmaker. Mr. Longacre was appointed, successively, foundry superintendent of the Johnstown, Pa.,

G. W. Altman

plant; general superintendent of the Trenton plant; and general superintendent of all company plants. He was elected a vice-president in 1935 and a director of the company in 1942.

Mike Lauriente, field engineer for the Pittsburgh Lectromelt Furnace Corp., Pittsburgh, has been appointed a junior instructor-graduate student at Johns Hopkins University. Holder of a B. S. from the Illinois Institute of Technology and an

Mike Lauriente

M.S. from the Michigan College of Mining and Technology, Mr. Lauriente has been employed by the McCormick Works of the International Harvester Co., Chicago, and the Wisconsin Steel Works, Chicago, prior to joining Pittsburgh Lectromelt. He served as supervisor of a Palermo, Sicily, foundry for the Navy in World War II.

Gustav Laub has been elected vice-president in charge of sales for the Vanadium Corp. of America, New York, and **Ward A. Miller,** company vice-president and director, will administer Vanadium Corp.'s sales and technical divisions. Mr. Laub was assistant vice-president and general manager of sales prior to his present appointment.

C. B. Paden, for 36 years an employee of Gunite Foundries Corp., Rockford, Ill., has been appointed works manager. Mr. Paden, during his long career with

C. B. Paden

Gunite, has served in a number of capacities, including those of cleaning room and general foundry superintendent.

Edwin A. Swensson has been appointed sales and service engineer for the National Engineering Co., Chicago, and will handle sales in Michigan, and the cities of Toledo, Ohio, and Windsor, Ont., Canada. Mr. Swensson, who studied at the Illinois Institute of Technology, has been with National Engineering for seven years and has had experience in conveyor equipment sales as well as in foundry engineering. He will maintain an office at 2970 West Grand Blvd., Detroit.

Arthur Kuiper was recently appointed treasurer of the Continental Foundry & Machine Co., East Chicago, Ind., at a recent meeting of the company's Board of Directors. Mr. Kuiper succeeds **W. L. Spencer,** who has retired.

Kurt A. Miericke, Chicago foundry consultant, has been named sales representative for the Michigan Oven Co., Detroit. Mr. Miericke will handle sales of foundry ovens in the Chicago district, comprising northern Illinois, northwestern Indiana, Wisconsin and Iowa. Prior to becoming a foundry consultant, Mr. Miericke was development engineer for the United States Gypsum Co., Chicago.

Jack Richardson has been appointed sales manager for the William R. Barnes Co., Ltd., Hamilton, Ont., Canada. He was sales manager for United Smelting & Refining Co., Ltd., Hamilton, prior to joining Barnes. He succeeds **Reginald M. Littlejohn,** who resigned to purchase and operate the Hamilton Facing Mill Co.

C. W. Weedfall has been named production and foundry engineer for the Benton Harbor Malleable Industries, Inc., Benton Harbor, Mich. Mr. Weedfall was for many years associated with General Motors Corp.'s Saginaw Malleable Iron plant, Saginaw, Mich., and with the Baker-Perkins Co. there. In his new capacity, Mr. Weedfall will be in charge of Benton Harbor's sales engineering, pattern and die design and tooling departments.

Dr. Douglas C. Williams, assistant professor, Department of Industrial Engineering, Ohio State University, was recently raised to associate professor. A graduate of Beloit College, Dr. Williams was employed in the laboratories of American Steel Foundries for four years, leaving there to attend Cornell Univer-

D. C. Williams

sity as an A.F.S. Research Fellow. While at Cornell, Dr. Williams received his M.S. and Ph. D. degrees. Dr. Williams has been instrumental in the formation of the A.F.S. Student Chapter at Ohio State and acts as its Faculty Advisor.

E. C. Meagher has been appointed Milwaukee district representative for the Federal Foundry Supply Co., Cleveland. Mr. Meagher, who has sold refractory products in the Milwaukee area for 11 years, will operate from Federal's offices at 647 W. Virginia St., Milwaukee.

OBITUARIES

Francis LeBaron, president and treasurer of the E. L. LeBaron Foundry Co., Brockton, Mass., died September 26.

J. E. Jones, treasurer and general manager and one of the founders of the Reliance Foundry Co., Richmond, Ind., died July 23. Mr. Jones had served as general manager of the company since its formation in 1912.

Thomas H. Terry, 61, Cleveland representative for the Federal Foundry Supply Co., Cleveland, died September 13. Mr. Terry had been a sales representative for the company since 1918 in several midwestern territories.

James B. Crowley, 78, secretary of the Pioneer Foundry Co., Inc., Jackson, Mich., died September 14 following a short illness. Mr. Crowley had served as secretary of the Pioneer Foundry Co., Inc. since its organization in 1905.

B. A. Patch, Jr., Chicago district manager for the Ohio Ferro Alloys Co., died of a heart attack October 17.

William G. Nichols, 87, retired president of the Cox Foundry & Machine Co., Atlanta, Ga., died August 9. Mr. Nichols was vice-president and general manager of the Griffin Mfg. Co., Griffin, Ga., prior to joining Cox Foundry & Machine Co.

Donald C. Bakewell, 61, vice-president in charge of sales for the Blaw-Knox Co., Pittsburgh, died September 10. A past president of the National Foundry Association and the Steel Founders' Society of America, Mr. Bakewell was president of the Duquesne Steel Foundry Co., Pittsburgh, and vice-president of its successor company, Continental Roll & Steel Foundry, prior to joining Blaw-Knox in 1937.

Theodore W. Crossen, retired assistant to the vice-president at the General Steel Casting Corp.'s Eddystone, Pa., plant, died August 28.

David Basch, 56, technical representative for Almin, Ltd., of Great Britain, died October 2 in Schenectady N. Y. Mr. Basch had been active in A.F.S. technical committee work for many years and at the time of his death was a member of the A.F.S. Aluminum and Magnesium Division's Executive, Alloy Recommendation, Die Castings and Sand Castings Committees and chairman of the Division's Committees on Centrifugal Casting and Test Bars. He was also a member of the A.F.S. Precision Investment Casting Com-

David Basch

mittee (General). A graduate of the Royal Polytechnic Institute, Berlin-Charlottenburg, Germany, Mr. Basch came to this country in 1899 and was employed by the General Electric Co. as a draftsman. He remained with General Electric until 1945 when he resigned as a consultant on non-ferrous materials and manufacturing processes to become technical advisor to Almin Ltd. and several other firms. In addition to his A.F.S. technical activities, Mr. Basch was a member of the Ordnance Association and of several ASTM technical committees.

Pangborn Corp., Hagerstown, Md., was host to the first fall meeting of the Chesapeake Chapter. Some 60 Chapter members were Pangborn's guests at a luncheon following a tour of the plant, and later in the day visited the Fairchild Aircraft & Engine Co. (Photo courtesy A. Lesley Gardner, Pangborn Corp).

CHAPTER ACTIVITIES NEWS

Northern California

J. M. Snyder
Jos. Musto Sons, Keenan Co.
Entertainment Chairman

A HOLE-IN-ONE was a highlight of the Chapter's Annual Golf Tournament and Steak Dinner, held October 14 at the Orinda Country Club. The lucky golfer, Edward Welch of the American Brake Shoe Co.'s Amsco Div., Oakland, used a No. 9 iron on the 117-yard eighth hole for the feat.

Sports events winners for the day were golf low gross (foundryman)—Harris Donaldson, Brumley-Donaldson Corp.; golf low gross (guest)—Bill MacGregor, Columbia Steel Co.; golf low net (foundryman)—Roy Hoag, General Metals Corp.; golf low net (guest)—Paul Williams, Be-Ge Mfg. Co.; Gilroy Blind Bogie (a three-way tie)—Philip Rodger, General Metals Corp.; Harry Miller, Ingersoll-Rand Co.; and Mel Matthews, American Brass Iron Foundry. The putting contest was won by Edward Stevens, American Brass & Iron Foundry, and the horseshoe pitching contest by Dale Rasmussen, Palmquist Foundry.

Responsible in a large measure for the success of the affair were members of the Golf Committee:

Edward Brumley, Brumley-Donaldson Corp.; Peter Valentine, Jr., Del Monte Sand Co.; Gordon Martin, Atlas Foundry & Mfg. Co.; Clayton Russell, Phoenix Iron Works; Mel Matthews, American Brass & Iron Foundry; Norman Schlegal, Vulcan Iron Foundry; Gordon Palmquist, Palmquist Foundry; A. Rubin, Globe Metals Co.; and Danial Henry, Federated Metals Div., American Smelting & Refining Co.

Tablemates at Northern Illinois-Southern Wisconsin Chapter's October 11 meeting, held at the Freeport Hotel, Freeport, Ill., were these five members from Fairbanks, Morse & Co., Beloit, Wis. Left to right: Herbert Hansen, Dewey Milkinsen, Edward Rock, Marion Funk and Al Gorstecki.

Ohio State University

Dallas M. Marsh
Publicity Chairman

THE FIRST MEETING of the Student Chapter's 1949-50 season was held October 11 in the Industrial Engineering Bldg. at the University.

Robert Gardner, Ford Motor Co., Dearborn, Mich., provided a running commentary on the film, *"Iron Ore to Motive Power,"* a film covering Ford foundry operations, showing mechanized production of cylinder block castings and their machining in detail. A discussion of the technical aspects of foundry mass production followed showing of the film.

Wives and friends of Chapter members were invited to see how Chapter meetings are conducted. In all, 55 persons were present.

Chapter Chairman Harold J. Gonya opened the meeting, and was followed by Dr. D. C. Williams, faculty advisor, who announced that work will begin soon on the new conveyor and sand conditioning systems to be installed in the school foundry.

Following the meeting, refreshments

were served by Croft Merritt, Entertainment Committee chairman.

Newly-installed chapter officers are: *Chairman,* Harold J. Gonya; *vice-chairman,* Dallas M. Marsh; *secretary,* Charles J. Weiland; and *treasurer,* Donald R. Dunlap.

On October 10 the Student Chapter officers were the dinner guests of A.F.S. National Director Norman J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio, at the monthly meeting of the Central Ohio Chapter.

Tri-State

Dale Hall
Oklahoma Steel Castings Co.
Publicity Chairman

MEMBERS AND GUESTS gathered for the first meeting of the 1949-50 season, October 14, at the Hotel Alvin in Tulsa, Okla.

George A. Fischer, Jr., of the St. Louis office of International Nickel Co., Inc., spoke on *"A New Cast, Ferrous Engineering Material."*

The metallurgical and engineering advantages of nodular iron were explained by the use of slides, and it was pointed out that this material breaches the gap between irons and the plain carbon steels.

Michiana

J. P. Jordan
Dodge Manufacturing Corporation
Secretary-Treasurer

THE OCTOBER MEETING was held at the Whitcomb Hotel, St. Joseph, Mich., October 4. The subject of the meeting was *"Industrial Hazards,"* and a model display was used in conjunction with the talk to demonstrate methods of industrial health control.

Representatives from the Industrial Health Division of the Michigan State Health Dept. who presented the display and talk were K. E. Robinson, R. S. McClintock, J. T. Bower, and R. Scovil. Representatives from the Industrial Health Division of the Indiana State Health Dept. were present to answer questions in the discussion following the demonstration; they were R. McGlasson, H. E. Bumstead, and J. F. Keppler. It was pointed out that both groups are available to all industrial plants to assist any industry in protecting the workers health and to make recommendations.

Pictured at Northern California Chapter's Annual Golf Tournament and Steak Dinner, October 14, are (top, left) Edward Brumley, Brumley-Donaldson Co., and Edward Finley, San Francisco Iron Foundry; (top, right) Edward Welch, American Manganese Steel Div., who scored a hole-in-one in the golf tournament, headed the chow line; (bottom, left) Clayton Russell, Phoenix Iron Works, smiles over the day's gate receipts; (center) Jay Snyder, National Grinding Wheel Co., John Russo, Russo Foundry & Equipment Co., and Peter Valentine of Del Monte Sand Co., compare golf scores; (right) A.F.S. National Director Robert Gregg, Reliance Regulator Co., enjoyed his steak. (Photo: S. D. Russell, Phoenix Iron Works)

Detroit

Julian N. Phelps
Vanadium Corp. of America
Chapter Secretary

THE INFORMATIVE and provocative A.F.S. film *"Fluid Flow in Transparent Molds"* provided the Detroit Chapter with a technical program of interest to all who attended. This film, a progress report of the Research Committee of the Aluminum and Magnesium Division, A.F.S., was prepared as a joint project of the committee and the Batelle Memorial Institute.

The Detroit chapter is particularly fortunate to count the chairman of this committee, Robert F. Thomson, International Nickel Co., as a member and Chapter director.

Dr. Thomson gave a running commentary as the film progressed, directing attention to some factors likely to

Members of the Central Indiana Chapter enjoyed golf, horseshoes, and a chance to get together with their fellow foundrymen at the Annual Stag Outing and Picnic, held at the Lakeshore Country Club, Indianapolis, September 10. (Photograph courtesy Henry Yeager of International Harvester Co., Indianapolis)

be overlooked. At the close of the film, Dr. Thomson invited criticism of the work already done and suggestions for the direction of further research. Such an invitation was all the audience needed and a lengthy question and answer session followed.

The coffee talk *"Are You As Good A Citizen As You Think You Are?"* showed that foundrymen can count themselves above the average in citizenship. Ernest Jones, Deputy City Clerk of the City of Detroit, the speaker, demonstrated this by a survey of the roster, which showed that 65 per cent of the registered Detroit membership voted in the recent primary election.

Frank S. Brewster, Harry W. Dietert Co., was recipient of the free dinner.

Prof. C. C. Sigerfoos, Michigan State College, East Lansing, examines cast bronze book ends presented him by the Central Michigan Chapter at its September meeting in recognition of his work as its 1948-49 Chapter chairman.

Washington
Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

A.F.S. NATIONAL PRESIDENT Edwin W. Horlebein was guest of honor at the first fall meeting of the Chapter, held at the Gowman Hotel, Seattle.

Mr. Horlebein commented on some recent changes made in A.F.S. The National Directors, he said, are members of the Society whose function it is to pass on rules and regulations which put the entire resources of A.F.S. at the service of the industry.

Mr. Horlebein pointed out the need for more educational work at the secondary school level. Books are now being prepared and other work along this line is now being carried out.

It was recently necessary to reorganize the finances of the Society in order to accomplish its objectives, Mr. Horlebein said, adding that A.F.S. research activities are being broadened and extended.

President Horlebein concluded by saying that every Chapter has within itself the necessary material, "spark plugs" so to speak, to develop and bring A.F.S. to the fore. This, he said, is a challenge to Chapter members to participate voluntarily and unselfishly in the work of A.F.S.

Chapter Chairman Edward D. Boyle, Puget Sound Naval Shipyard, announced the names of three new Chapter directors—Jack Reardon, Federated Metals Div., American Smelting & Refining Co., Seattle; Stanley H. Marshall, Atlas Foundry & Machine Co., Tacoma; and Alvin T. Zandt, Zandt Brass Foundry, Seattle.

Chapter Chairman Boyle, speaker of the evening, spoke on *"Insulation of Risers to Promote Fluidity in Non-Ferrous and Ferrous Metals."* The material used by Mr. Boyle in work on this project is a sintered diatomaceous earth product.

This material is ground to powder, mixed with bentonite, phenolic resin

FUTURE CHAPTER

● ***NOVEMBER 14***
CINCINNATI DISTRICT
Engineering Society, Cincinnati
T. E. BARLOW
Eastern Clay Products, Inc.
Subject to be announced.

CENTRAL OHIO
Hotel Shawnee, Springfield
C. O. BARNETT
Foundry Equipment Co.
"Modern Mold and Core Ovens"

● ***NOVEMBER 16***
ST. LOUIS DISTRICT
York Hotel, St. Louis
CLYDE A. SANDERS
American Colloid Co.
"Side Floor Molder vs. Machine Molder"

● ***NOVEMBER 17***
CHESAPEAKE
Engineers' Club, Baltimore
S. C. MASSARI
A.F.S. Technical Director
Film: *"Fluid Flow in Transparent Molds"*

TWIN CITY
Covered Wagon, Minneapolis
J. C. NEEMES, JR.
International Nickel Co.
"Nodular Cast Iron"
Joint Meeting with ASM.

● ***NOVEMBER 18***
WASHINGTON
Gowman Hotel, Seattle
R. L. LEE
General Motors Corp.
Subject to be announced.

BIRMINGHAM DISTRICT
Tutwiler Hotel, Birmingham
R. L. MCILVAINE
National Engineering Co.
"Mechanization on the Installment Plan"

DETROIT
Rotunda Bldg., Ford Motor Co.
INSPECTION TOUR OF FORD MOTOR CO. FOUNDRY FACILITIES

● ***NOVEMBER 19***
ONTARIO
Royal Connaught Hotel, Hamilton
S. W. BRINSON
Philadelphia Naval Shipyard
"Gating Systems for Metal Castings"

● ***NOVEMBER 21***
WESTERN MICHIGAN
Morton House, Grand Rapids
D. C. MCCUTCHEON
Ford Motor Co.
"Industrial Applications of Radioisotopes"

QUAD CITY
Ft. Armstrong Hotel, Rock Island, Ill.
W. F. BOHM
Buick Motor Div., GMC
"Cupola Operation"

● ***NOVEMBER 25-26***
CENTRAL NEW YORK
EASTERN NEW YORK
ROCHESTER
WESTERN NEW YORK
Syracuse University, Syracuse
NEW YORK STATE REGIONAL CONFERENCE

● ***NOVEMBER 28***
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
T. E. BARLOW
Eastern Clay Products, Inc.
"Foundry Problems in General"

TIMBERLINE
Oxford Hotel, Denver
R. L. LEE
General Motors Corp.
"Man to Man on the Job"

● ***DECEMBER 1***
SAGINAW VALLEY
Fisher's Hotel, Frankenmuth, Mich.
PANEL DISCUSSIONS ON METAL CONTROL

● ***DECEMBER 2***
WESTERN NEW YORK
Sheraton Hotel, Buffalo
W. C. RUDD
Induction Heating Corp.
"Electronic Core Baking"

MEETING PROGRAM

● ***DECEMBER 5***
MICHIANA
LaSalle Hotel, South Bend, Ind.
R. L. Lee
General Motors Corp.
"Foundry Problems in General"

CENTRAL INDIANA
Athenaeum, Indianapolis
Eugene Conreaux
Illinois Cereal Mills
"Core Molding Sand Practice"

● ***DECEMBER 6***
PHILADELPHIA
Annual Christmas Party

● ***DECEMBER 7***
TOLEDO
Toledo Yacht Club
Speaker to be announced
"Nodular Cast Iron"

MO-KAN
President Hotel, Kansas City, Mo.
Dinner Dance

● ***DECEMBER 8***
ST. LOUIS DISTRICT
York Hotel, St. Louis
Annual Christmas Party

● ***DECEMBER 9***
QUAD CITY
Blackhawk Hotel, Davenport, Ia.
Annual Christmas Stag Party

EASTERN CANADA
Mount Royal Hotel, Montreal
Alec Pirrie
Gurney Foundry Co., Ltd.
"Pattern Engineering and Foundry Practice"

WISCONSIN
Hotel Schroeder, Milwaukee
Annual Christmas Party

● ***DECEMBER 9 (cont'd)***
METROPOLITAN
Essex House, Newark, N. J.
Annual Christmas Party

● ***DECEMBER 10***
N. ILLINOIS-S. WISCONSIN
Faust Hotel, Rockford, Ill.
Annual Christmas Party

● ***DECEMBER 12***
CENTRAL OHIO
Chittenden Hotel, Columbus
Annual Christmas Party

● ***DECEMBER 13***
ROCHESTER
Seneca Hotel, Rochester, N. Y.
L. Beinke
Plaster Process Castings Co.
"Aluminum and Plastic Pressure Plates"

● ***DECEMBER 15***
WESTERN MICHIGAN
Spring Lake Country Club
Annual Christmas Party (Members only)

NORTHEASTERN OHIO
Carter Hotel, Cleveland
Annual Christmas Party

● ***DECEMBER 16***
TRI-STATE
Tulsa, Okla.
W. B. George
R. Lavin & Sons, Inc.
"Metallurgy in the Brass Foundry"

NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
Annual Christmas Party

● ***DECEMBER 17***
TWIN CITY
Nicollet Hotel, Minneapolis
Annual Christmas Party

CINCINNATI DISTRICT
Netherland Plaza Hotel, Cincinnati
Annual Christmas Party

and water. It is shaped into collars, pads and core shapes, or can be formed by hand in its plastic state to form anti-chillers and patterns from which chills may be cast of metal. The material dries in from one to four hours at 400 F. Mr. Boyle has used the material in these baked shapes for insulation of risers on stainless steel, copper nickel, cast iron, manganese bronze and other bronze castings, with excellent results, he states.

Mr. Boyle also spoke of using the powdered, sintered material as a riser covering to retard radiation. The material is used plain on the bronzes and cast iron, and for aluminum risers it is preheated and obtains excellent feeding on heavy aluminum billets.

For anti-piping compound on steel risers, Mr. Boyle said, the material is mixed with a small amount of fire-clay and graphite and used as a powdered covering. This, he said, effectively prevents freezing over of the riser top.

Used in conjunction with exothermic materials, the powdered covering increases their efficiency by eliminating loss of heat by radiation, according to the speaker.

Experiments show that by complete insulation of risers by collars and top covering to retain the heat in the riser, temperature gradients can be established between casting and riser which give the ultimate in riser efficiency.

To go beyond this point, the speaker concluded, involves the use of exothermic materials to manufacture a portion of the riser metal in the riser itself—a process in which the cost per lb of molten metal is considerably higher than furnace melting.

British Columbia

William R. Holeton
British Columbia Research Council
Chapter Secretary-Treasurer

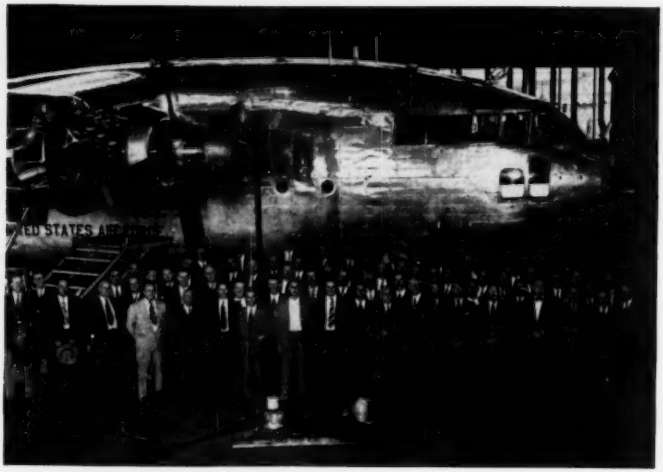
"National President's Night" was the designation of the first general meeting of the season, held September 20 at the Pacific Athletic Club.

A.F.S. National President Edwin W. Horlebein brought greetings from the Society's membership to the Chapter and stressed the importance of cooperation between all branches of the Society in making A.F.S. of greater benefit to the entire membership.

John Grennan of the University of Michigan, left, and Harry W. Dietert of the Harry W. Dietert Co., Detroit, were guests at the October 6 meeting of the Saginaw Valley Chapter, held in Frankenmuth, Mich. Standing is Chapter Secretary-Treasurer Raymond H. Klawuhn, General Foundry & Mfg. Co., Flint.

The technical speaker for the evening was R. Keith Brown, British Columbia Research Council, who spoke on *"Radiography as Applied to Local Foundries."* Mr. Brown demonstrated and illustrated each point he made.

Educational Chairman William Armstrong of the University of British Columbia reviewed the A.F.S. course in *"Structures and Properties of Cast Metals,"* started in October at the Vancouver Vocational Institute.



Pictured in front of a giant Army Air Force plane being constructed by the Fairchild Aircraft & Engine Co., Hagerstown, Md., are members of the Chesapeake Chapter, whose first fall meeting included plant visitations to Fairchild and the Pangborn Corp., a luncheon, dinner at the Fountainhead Country Club, Hagerstown, and an evening technical session.

Eastern New York

George E. Danner
American Locomotive Co.
Publicity Chairman

THE OCTBER 18 MEETING, held at the Circle Inn, Lathams, N. Y., drew a large crowd. Principal speaker of the evening was Harry H. Kessler, Sorbo-Mat Process Engineers, St. Louis, on *"Gating and Risering of Castings."*

Mr. Kessler's ideas on the subject, backed by 25 years' foundry experience, brought forth an interesting discussion on specific casting problems.

Central Indiana

W. K. Mitchell
L. W. & W. K. Mitchell Co.
Chapter Reporter

THE FIRST REGULAR MEETING of the 1949-50 season, held at the Athenaeum, Indianapolis, drew an attendance of more than 125 members to hear an interesting and timely talk on *"Nodular Cast Iron"* by R. G. McElwee, Vanadium Corp. of America, Detroit.

In the course of his address, which was illustrated by lantern slides, Mr. McElwee stressed the necessity for immediately putting recent nodular iron discoveries on a realistic and sound basis. In the maze of facts surrounding this revolutionary discovery, foundrymen must determine just what is desired and needed in this field, he said.

The speaker pointed out that nodular iron is not yet cheaper than the process of annealing iron. He attempted to quell the fear that nodular iron processing is apt to cut deeply into the malleable and steel casting fields. It is more apt to be used for special purpose castings only, in Mr. McElwee's opinion.

Elasticity was cited by the speaker as the most important property of nodular iron, rather than the ductility of this metal. The automotive industry he said, is becoming increasingly interested in nodular iron because of its unusually high resistance to fatigue.

Probably any foundry can make nodular iron, but only after proper experimentation, Mr. McElwee emphasized. No foundry should expect to pour good nodular iron the first time, the speaker said, warning against over-optimism in this new field. In pouring this metal, foundrymen must throw out many of the old "yardsticks" for casting and adopt new standards and ideas, the speaker said, adding that foundry sales forces will, to sell nodular iron, be forced to place more emphasis on engineering knowledge.

Technical Chairman for the meeting was Paul Ulmer, Link-Belt Co., Indianapolis. A business meeting of the Board of Directors preceded the dinner.

Chesapeake

Jack H. Schaum
Naval Research Laboratory
Chapter Reporter

FOLLOWING PAST CUSTOM of holding the first fall meeting away from Baltimore, over 60 members of the Chesapeake Chapter gathered in Hagerstown to visit the Pangborn Corp.

After being guests of Pangborn at a luncheon in the Hotel Alexander, the group spent the afternoon observing assembly of "Flying Boxcars" at the Fairchild Aircraft Plant. Refreshments and a fine dinner were served at the Fountainhead Country Club.

In an illustrated talk entitled *"Technology of Foundry Sand Testing"* Frank Brewster, Harry W. Dietert Co., Detroit, emphasized the importance of moisture control in foundry sands,

Quad City Chapter officers and directors at the October meeting with speaker Bradley H. Booth, Carpenter Bros., Inc., Milwaukee (seated, center) are, standing, left to right: P. E. Wright, Fairbanks, Morse & Co.; C. S. Humphrey, C. S. Humphrey Co.; William C. Bell, Frank Foundries Corp.; Vice-Chairman Harold A. Rasmussen, General Pattern Corp.; A. A. Zuber, Carver Pump Co.; J. H. Nelsen, Mississippi Foundry Corp.; and R. H. Swartz, Riverside Foundry Corp. Seated, left to right: E. C. Zirzow, Deere & Co.; Mr. Booth; and Chairman E. P. Closen, Deere & Co.

since it affects green permeability, green compression strength, blows, deformation and slope of stress-strain curve, according to the speaker.

Mr. Brewster reviewed briefly the equipment and procedure for making moisture, permeability, compression, clay, sieve, hardness, and hot strength tests. Rat tails take place at 1100 F and can be decreased by reducing hot strength or expansion ability of the sand, he concluded. Questions from the floor were answered following conclusion of Mr. Brewster's talk.

Robert Gardner, Ford Motor Co., Dearborn, Mich., provided a running commentary for the film, "Iron Ore to Motive Power," *at the October 11 meeting of the Ohio State University Student Chapter.*

Missouri School of Mines

Jack Absalom
Chapter Reporter

THE FIRST MEETING of the fall semester was attended by nearly 150 members and visitors.

Among the visitors were several members of the St. Louis chapter, including one of our recent graduates, John Mitchell, now with Key Co., St. Louis, as a metallurgist.

William Rupprecht, the new president of the MSM Student Chapter, opened the meeting by telling the new members about the foundry equipment that the St. Louis Chapter has given to the school for joint use by the school and Chapter. He also expressed appreciation for the cooperation the St. Louis members are giving in placing graduates in foundry jobs.

A. L. Hunt of American Brake Shoe Company, St. Louis, gave a short talk on the need for engineering graduates in the foundry industry. He was followed by Curtis Wilson, Dean of the School of Mines, who announced that the school is to be a recipient of the

A. F. S. CHAPTER DIRECTORY

BIRMINGHAM DISTRICT CHAPTER *Secretary-Treasurer,* F. K. Brown, Adams, Rowe & Norman, Inc., 729 Brown-Marx Bldg., Birmingham, Ala.

BRITISH COLUMBIA CHAPTER *Secretary-Treasurer,* W. R. Holeton, British Columbia Research Council, University of B.C., Vancouver, B.C., Canada

CANTON DISTRICT CHAPTER *Secretary,* Paul H. Muntz, United Engineering & Foundry Co., 1400 Grace Ave., N. E. Canton, Ohio

CENTRAL ILLINOIS CHAPTER *Secretary-Treasurer,* Robert E. Dickison, Brass Foundry Company, 713 S. Adams, Peoria, Ill.

CENTRAL INDIANA CHAPTER *Secretary,* Paul V. Faulk, Box 16, Clayton, Indiana

CENTRAL MICHIGAN CHAPTER *Secretary-Treasurer,* David Sherman, Engineering Castings Inc., Marshall, Mich.

CENTRAL NEW YORK CHAPTER *Secretary,* William D. Dunn, 432 Buckingham Ave., Syracuse, N. Y.

CENTRAL OHIO CHAPTER *Secretary,* D. E. Krause, Gray Iron Research Institute, 1532 Cardiff Rd., Columbus, Ohio

CHESAPEAKE CHAPTER *Secretary-Treasurer,* Clausen A. Robeck, Gibson & Kirk Co., Warner & Bayard Sts., Baltimore 30, Md.

CHICAGO CHAPTER *Secretary,* G. J. Biddle, Illinois Clay Products Co., 608 S. Dearborn St., Chicago

CINCINNATI DISTRICT CHAPTER *Secretary,* Burt A. Genthe, S. Obermayer Co., 647 Evans St., Cincinnati, 4.

DETROIT CHAPTER *Secretary,* J. N. Phelps, Vanadium Corp. of America, 2440 Book Tower, Detroit

EASTERN CANADA CHAPTER *Secretary,* J. G. Hunt, Dominion Engineering Works, Ltd., P. O. Box 220, Montreal, Que., Can.

EASTERN NEW YORK CHAPTER *Secretary-Treasurer,* Leigh M. Townley, Adirondack Foundries & Steel Co., Watervliet, N. Y.

METROPOLITAN CHAPTER *Secretary,* J. F. Bauer, Hickman, Williams & Co., 70 Pine St., New York

MEXICO CITY CHAPTER *Secretary,* N. S. Covacevich, Apartado 1030, Mexico, D. F., Mexico

MICHIANA CHAPTER *Secretary-Treasurer,* J. Paul Jordan, Dodge Mfg. Corp., Mishawaka, Ind.

MO-KAN CHAPTER *Secretary,* C. W. Myers, Jr., Morton-Myers Co., P. O. Box 1039, Kansas City, Mo.

NORTHEASTERN OHIO CHAPTER *Secretary,* A. J. Harlan, Hickman, Williams & Co., 1154 Union Commerce Bldg., Cleveland, O.

NORTHERN CALIFORNIA CHAPTER *Secretary,* Charles R. Marshall, 90 Second St., San Francisco

NORTHERN ILLINOIS-SOUTHERN WISCONSIN *Secretary,* Carl L. Dahlquist, 120 So. Highland, Rockford, Ill.

NORTHWESTERN PENNSYLVANIA CHAPTER *Secretary,* Earl Strick, Erie Malleable Iron Co., Erie, Pa.

ONTARIO CHAPTER *Secretary-Treasurer,* G. L. White, Westman Publications, Ltd., 137 Wellington St. W., Toronto, Ont., Canada

OREGON CHAPTER *Secretary-Treasurer,* Harry K. McAllister, 627 S. E. 71st Ave., Portland, Ore.

PHILADELPHIA CHAPTER *Secretary-Treasurer,* W. B. Coleman, W. B. Coleman & Co., 9th and Rising Sun Ave., Philadelphia

QUAD CITY CHAPTER *Secretary-Treasurer,* C. R. Marthens, Marthens Co., 3094 16th St., Moline, Ill.

ROCHESTER CHAPTER *Secretary-Treasurer,* Leon C. Kimpal, Rochester Gas & Electric Corp., 89 East Ave., Rochester, N. Y.

SAGINAW VALLEY CHAPTER *Secretary-Treasurer,* Raymond H. Klawuhn, General Foundry & Mfg. Co., P. O. Box 119, Flint, Mich.

ST. LOUIS DISTRICT CHAPTER *Secretary,* P. E. Retzlaff, Busch-Sulzer Bros.-Diesel Engine Co., Div., Nordberg Mfg. Co., 3300 S. Second St., St. Louis

SOUTHERN CALIFORNIA CHAPTER *Secretary,* Harold G. Pagenkopp, Angelus Pattern Works, 2084 Belgrave Ave., Huntington Pk., California

TENNESSEE CHAPTER *Secretary-Treasurer,* Herman Bohr, Jr., Robbins & Bohr, Chattanooga Bank, Chattanooga, Tenn.

TEXAS CHAPTER *Secretary,* P. B. Croom, 5210 Canal, Houston, Texas

TIMBERLINE CHAPTER *Secretary,* James Schmuck, Rotary Steel Castings Co., 1425—5th St., Denver, Colorado

TOLEDO CHAPTER *Secretary-Treasurer,* R. C. Van Hellen, Unitcast Corp., Box 8, Station E, Toledo, Ohio

TRI-STATE CHAPTER *Secretary,* D. A. Mitchell, Progressive Brass Co., 1702 East 6th, Tulsa, Okla.

TWIN-CITY CHAPTER *Secretary-Treasurer,* Lillian K. Polzin, Minneapolis Chamber of Commerce, 1750 Hennepin at Groveland Terrace, Minneapolis

WASHINGTON CHAPTER *Secretary,* F. R. Young, E. A. Wilcox Co., 517 Arctic Bldg., Seattle 4, Wash.

WESTERN MICHIGAN CHAPTER *Secretary,* Ross Shaffer, Lake Foundry & Machine Co., First and Water Sts., Muskegon, Mich.

WESTERN NEW YORK CHAPTER *Secretary,* R. E. Walsh, Hickman, Williams & Co., 52 Eastwood Place, Buffalo, N. Y.

WISCONSIN CHAPTER *Secretary,* G. E. Tisdale, Zenith Foundry Co., 1501 So. 85rd St., West Allis, Wis.

STUDENT CHAPTERS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY *Secretary-Treasurer,* Robert N. Randall

UNIVERSITY OF ILLINOIS *Secretary,* Eugene Keith Van Ness

UNIVERSITY OF MINNESOTA

MISSOURI SCHOOL OF MINES *Secretary,* Martin L. Slawsky

OHIO STATE UNIVERSITY *Secretary-Treasurer,* Arthur Stoner

OREGON STATE COLLEGE *Secretary,* Leonard M. Preston

TEXAS A & M COLLEGE *Secretary,* Victor C. Henkel

Part of the crowd who attended the September dinner meeting of the Northeastern Ohio Chapter. (Photo by Sterling Farmer, Sand Products Corp.)

Foundry Educational Foundation scholarship fund. This fund, he explained, is to be used for deserving students interested in foundry.

A demonstration of molding and aluminum casting was given in the new foundry laboratory by R. Kenyon of Lewin-Mathes Co. and W. Pickel of American Brake Shoe Co., St. Louis. This was followed by an informal discussion period over coffee and donuts.

Western Michigan

Rolfe Jenkins
Campbell, Wyant & Cannon Fdry. Co.
News Editor and Photographer

THE ANNUAL JOINT MEETING with the American Society for Metals, November 21, will be addressed by Donald M. McCutcheon, Ford Motor Co., Dearborn, Mich., whose subject will be *"Industrial Application of Radioisotopes."* The meeting will be held at the Morton House, Grand Rapids.

Chapter directors, meeting recently, set December 15 as the date for the Annual Christmas Party, to be held at the Spring Lake Country Club, and laid the foundation for the Chapter's next Annual Picnic, some 10 months away. Those attending the meeting were Vice-Chairman Stanley H. Davis, Campbell, Wyant & Cannon Foundry Co.: Treasurer Lauren Ramsey, Paul M. Wiener Foundry Co.: Secretary Ross P. Schaffer, Director Robert DeVore and Vernon Tietsort, all of the Lakey Foundry & Machine Co.

Oregon State College

NEWLY-APPOINTED faculty advisor to the Student Chapter is James Smith, associate professor of Industrial Engineering, who succeeds Harry Dahlberg. Mr. Dahlberg, who recently left to join Twin City Testing & Engineering Laboratory, St. Paul, Minn., was responsible for the organization of the Student Chapter here and its members were sorry to see him leave. His successor, Mr. Smith is a graduate of OSC and has been working with the Chapter since its birth.

Committees are already very active and an exciting and busy year is anticipated. Meetings have been planned and speakers and films are being contacted. Field trips to foundries in the Portland area are on the calendar. The first big event will be a barbecue in the school foundry on December 2 under the direction of Robert Knighton. The idea was initiated last year. Wives and friends, plus several members of the A.F.S. Oregon Chapter are expected to attend.

An interesting recent meeting featured talks by those Student Chapter members who worked in West Coast foundries during the summer. They report that prospects for employment for OSC graduates in West Coast foundries are brighter this year. Films on steel and aluminum casting concluded the meeting.

Chicago

Paul Skirha, Jr.
Crane Co.
Chapter Reporter

THE FIRST MEETING of the season, held October 3 at the Chicago Bar Association, was attended by S. W. Aitken, Hammond Lane Ironfounders, Ltd., Dublin, chairman of the Irish Ironfounders Association, and several members of a French gray iron foundrymen's group visiting the United States under sponsorship of the Government's Economic Cooperation Administration. Among the French visitors were Paul Chatelin, head of the Technical Administration department of the French Foundry Technical Center, and Charles Haller, president and director general of the French firm of Bidez and Haller.

Speaker of the evening was Earl Shanner, Penton Publishing Co., Cleveland, whose subject was *"Looking Ahead in Business."*

(Continued on Page 78)

Photographed with guest speaker Bruce L. Simpson, National Engineering Co., Chicago, center, at the September 23 meeting of the Tennessee Chapter were, left, Vice-Chairman Paul Arnold, U. S. Pipe & Foundry Co., Chattanooga, and Chairman Karl Landgrebe, The Wheland Co., Chattanooga.

American Foundryman

Compounded to Stand the Test

HOLD THAT SAND!...

WITH AMAZING NEW SAND ARRESTER TUBE!

Patent Applied for!

POSITIVELY ELIMINATES SAND STEMS ON BLOWN CORES!

1. GUARANTEED FOR MORE THAN 100,000 BLOWS
2. AUTOMATICALLY DELIVERS PERFECT CORES
3. APPROVED BY THE MOST EXPERIENCED FOUNDRYMEN
4. INSTALL WITHOUT SPECIAL TOOLS
5. INSTALL IN TWO MINUTES — PUSH OUT THE OLD — PUSH IN THE NEW
6. SIMPLE TO INSTALL — PUSH OUT THE OLD — PUSH IN THE NEW
7. SPECIAL QUALITY, WEAR RESISTANT RUBBER — NOT AFFECTED BY AREA, OIL, WATER or TIME
8. TOUGH PLASTIC TUBES FUSED TO SEAMLESS STEEL TUBES BY OUR OWN SPECIAL PROCESS
9. STEEL TUBE HEAVILY PLATED AND RUST PROOF
10. SAND FLOWS FREELY INTO CORE BOX

...CORES, TIME and MONEY

...FOR YOU ENOUGH TUBES TO FIT ANY CORE BOX YOU ...YOU FEEL THAT THE TUBES ARE NOT WORTH ...ALL YOU PAY NO FURTHER CREDIT

...COUPON

MARTIN

ENGINEERING COMPANY

KEWANEE 9/13/49 ILLINOIS

Mr. John D. Murray, Adv. Mgr.
American Foundryman
222 W. Adams St.
Chicago 6, Ill.

Dear Mr. Murray:

Enclosed is a schedule of advertisements that our company has decided upon for American Foundryman. Frankly, we are very pleased with results to date. Coupons have been coming in consistently, and we are checking these carefully to gauge the market.

Of those received so far, American Foundryman has a distinct edge in the number of inquiries, with the advantage of an average ratio of 2 to 1 in sales over other publications.

It is on this record that we have decided to expand the schedule, per the enclosed.

Very truly yours,

MARTIN ENGINEERING COMPANY

E. F. Peterson

E. F. Peterson, Pres.

EFP/rh

There is no mistaking results and, from the tone of the letter reproduced here, there is no mistaking the fact that AMERICAN FOUNDRYMAN, judged in terms of results, is the leading sales producer for the marketing of foundry equipment and supplies.

Yes, you've seen this advertisement reproduced in the pages of media reaching the foundry field, and you will be interested to know that the advertiser has kept a close tally on returns. The outcome was conclusive . . . AMERICAN FOUNDRYMAN **outpulled other magazines 2 to 1** in completed sales! This can mean only one thing—AMERICAN FOUNDRYMAN is the magazine that manufacturers can depend upon for results . . . **the kind of results that mean profitable advertising.**

AMERICAN FOUNDRYMAN can "pull" equally as many returns for those firms whose products are suited for use by the thousands of subscriber-members who regularly look to **The Foundrymen's Own Magazine"** as a reliable source of information on the development and production of cast metals.

If AMERICAN FOUNDRYMAN isn't already scheduled for your 1949-50 sales program, it is only **good business** to do so immediately—it costs less than 2¢ per prospect to reach the readers of AMERICAN FOUNDRYMAN each month with an ad similar to the one reproduced above. Send for full details today!

American Foundryman

222 W. Adams St.,
Chicago 6, Ill.

CHAPTER ACTIVITIES

(Continued from Page 76)

Mr. Shanner spoke on employee cooperation and incentives, worldwide industrial conditions, and the effects of mechanization on the industry.

A. W. Gregg, Whiting Corp., Harvey, Ill., who represented the American Foundrymen's Society at the 1949 International Foundry Congress in Amsterdam and who presented the official A.F.S. paper there, *"Ferrous Melting Furnaces in the United States and Canada,"* (AMERICAN FOUNDRYMAN, October, 1949, Pages 27-32) gave a resume of his recent visits to European foundries. His story on the Congress appears on page 28 of this issue.

Central Michigan

Frank P. Tobakos
Publicity Chairman

MEETING SEPTEMBER 21 at the American Legion Clubhouse, Battle Creek, the Chapter heard Ray Witschey, A. P. Green Fire Brick Co., Chicago, speak and show a film on *"Foundry Refractories,"* depicting the manufacture of fire brick.

Refractories, Mr. Witschey said, are generally made by either wet or dry processes. The brick characteristics obtained will generally conform to users' specifications, he said, adding that the majority of bricks are made by semi-automatic processes but those of intricate shape must be made by hand.

Mr. Witschey stated that the producers of refractories have as many problems in the manufacturing of good bricks as foundrymen have in the making of good castings. The quality of the raw materials from which the bricks are made is carefully controlled. Before any clay can be mined samples must be taken and tested.

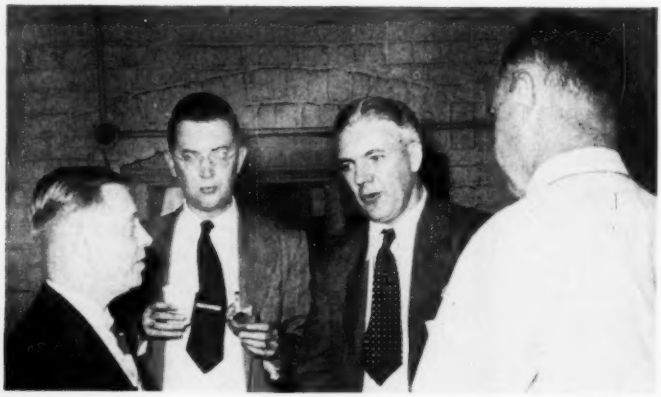
In the discussion that followed, Mr. Witschey was assisted by W. G. Twyman, of A. P. Green Fire Brick Co.

Erwin Doerschler, U. S. Foundry Company, Kalamazoo, presented a coffee talk on the foundry industry in Europe. He has only recently returned from a three month visit to Europe. The workers in Europe, Mr. Doerschler said, take pride in their work and keeping scrap down is the number one consideration.

Fitz Coghlin, Jr., Albion Malleable Iron Co., Chapter chairman, presided and Hugh Johnson of Grant Johnson & Sons, Kalamazoo, acted as technical chairman.

Prof. Charles C. Sigerfoos of Michigan State College was presented with a set of cast bronze book-ends in appreciation for his efforts as chairman of the Chapter last year.

Speakers' table occupants at Saginaw Valley Chapter's "Company and Sustaining Members' Night," October 6, were, seated, left to right: Vice-Chairman Howard H. Wilder, Eaton Mfg. Co., Vassar, Mich.; William A. Hambley, Wilson Foundry & Machine Co., Pontiac; Maurice Godwin, Bostick Foundry Co., Lapeer; Oscar L. Sundstedt, General Foundry & Mfg. Co., Flint. Standing, left to right: A. T. Peters, Dow Chemical Co., Midland, and Chapter Chairman Lyle L. Clark, Buick Motor Division, GMC.



Talking things over at the first fall meeting of the Missouri School of Mines Student Chapter were, left to right, Dean Curtis Wilson and Dr. A. Schlechten, Missouri School of Mines, George N. Shepherd, Sterling Steel Casting Co., East St. Louis, Ill., chairman of the A.F.S. St. Louis District Chapter, and (back to camera) Henry W. Meyer, General Steel Castings Corp., Granite City, Ill., St. Louis District Chapter Treasurer.

Toledo

BLINDFOLDS kept attendants at the October 5 meeting of the Toledo Chapter in the dark at the most unusual meeting ever put on by an A.F.S. chapter. The Chapter's 1949-50 season opened at the Toledo Yacht Club with a safety session which demonstrated the value of eyesight and the importance of preserving it. Foundrymen learned some of the problems of the blind by doing everyday tasks without benefit of their eyes. Everyone present participated and only the three who put on the program—E. F. Chittenden, once temporarily blind, and George

Zang, who have developed the program, and sound-effects man R. C. Van Hellen, all of Unitcast Corp., Toledo—could see what they were doing and knew what was coming next.

Completely in the dark, the audience experienced the difficulties of the blind and mentally vowed to always wear safety glasses as they lit and smoked cigarettes, filled and drank from glasses, tried to read the Braille alphabet, and learned to tell whether a light is off or on by the sound of the switch. By the end of the hour-long program—conducted with all the mystery and drama of a seance—chapter members were thankful they were only pretending to be blind.

Preceding the "Let's Pretend" program Chapter Chairman Harry C. Schwab, Bunting Brass & Bronze Co., Toledo, conducted a short business meeting and announced that Gladwell W. Davison, National Supply Co., would fill out the unexpired director's term of Sherril Kasle, Kasle Iron & Metal Co.

Herbert F. Scobie, editor, AMERICAN FOUNDRYMAN, greeted Toledo Chapter members on behalf of the National Organization and commented on the development of AMERICAN FOUNDRYMAN as a technical publication.

Texas A&M

F. L. Maxwell
Chapter Secretary

THE STUDENT CHAPTER'S first meeting of the year was held September 27 on the Texas A&M campus. Plans for the coming year were made and the following Chapter officers elected:

Chairman—Uvalde Stoermer; *vice-chairman*—G. W. Peterson; *secretary*—F. L. Maxwell, and *treasurer*—Robert L. Jones.

Mo-Kan

Thomas F. Shadwick
Witte Engine Works
Chapter Reporter

ON OCTOBER 5, for the first time, the Chapter held its monthly meeting at the Fairfax Airport. Previously, meetings had been held at Rockhurst College and other places in Kansas City, Mo. The new meeting place is centrally located for the membership and has excellent meeting facilities.

The meeting was well attended and began with a get-acquainted and fellowship hour. Guests, Chapter officers and directors were introduced during dinner. In the business session, members voted approval of the new meeting place, and announcements were made concerning plans for the November meeting and the Christmas Party.

Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., Barber, N. J., was the speaker of the evening and directed a technical session designed principally for non-ferrous foundrymen, but one which was enjoyed by gray iron and steel foundrymen as well as by non-ferrous foundrymen.

Mr. Colton passed around samples of defective brass and bronze hardware and bushing castings showing surface and under-surface porosity, dark spots, roughness and dross inclusions. He explained the defects and causes of each sample.

The speaker stated that the purpose of his discussion was for all foundrymen to learn something. There can be no secrets among foundrymen, he said, and all must get together to improve methods.

Mr. Colton divided his discussion into four principal parts: (1) making yellow brass castings to be polished; (2) difficulties in making high lead bushings; (3) making high-conductivity bronze castings, and (4) making nickel silver castings.

Some general recommendations made by Mr. Colton as a means of overcoming casting difficulties and reducing scrap losses were:

(1) Standardization of melting prac-

(Continued on Page 87)

Photographed at a Board of Directors meeting of the Northern California Chapter September 12 in San Francisco were, left to right: Treasurer Fred A. Mainzer, Pacific Brass Foundry, San Francisco; Vice-Chairman John R. Russo, Russo Foundry Equipment Co., Oakland; A.F.S. National President Edwin W. Horlebein; Chairman James L. Francis, Vulcan Steel Foundry, Oakland; and Secretary Charles R. Marshall, Industrial Foundry Supply Co., San Francisco. (Photo: S. D. Russell, Phoenix Iron Works)

Seated at the speakers' table at the October 3 meeting of the Metropolitan Chapter were, left to right: Chapter Chairman Thomas J. Wood, American Brake Shoe Co., New York; Clyde A. Sanders, American Colloid Co., Chicago, speaker of the evening; and John A. Bukowski, Worthington Pump & Machinery Corp., Harrison, N. J., a past chairman of the Chapter. (Photograph by John Bing, Metropolitan Refractories Corp., New York)

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Non-Ferrous Castings

NV101—Design, machining and finishing of aluminum, magnesium, brass and bronze castings are described in the *"Eclipse-Pioneer Book of Facts,"* 24-page illustrated booklet published by the Eclipse-Pioneer Division of Bendix Aviation Corp. Beginning with a brief description of the company's non-ferrous casting facilities and processes, the booklet goes on to describe the advantages, properties and applications of light metals and their alloys to industry. Detailed information on designing, machining and finishing magnesium, aluminum, and brass and bronze castings is furnished, together with tables and charts showing alloy specifications and mechanical properties, "do and don't" sketches, and machining data.

Sandslingers

NV102—A 36-page illustrated catalog recently published by Beardsley & Piper, Division of Pettibone Mulliken Corp., describes the company's nine models of stationary Sandslingers and Speedslingers, plus a complete description of the Sandslinger ramming method. Application photographs, specifications and detailed drawings are shown with each model. Photographs taken at 1/10,000 of a second depict slinger ramming action. Actual installations in foundries are shown.

Industry Progress

NV103—Half a century of major development are portrayed in *"Panghorn's Part In Progress,"* 24-page brochure depicting the industrial development of this 45-year old company. Beginning with the company's inception in 1904, the booklet describes developments in foundry blast cleaning up to the present, using interesting photographs and engravings of the foundry industry to contrast with photos of ultramodern foundry plant and equipment.

Foundry Education

NV104—Reprinted from the August, 1949, issue of AMERICAN FOUNDRYMAN is George K. Dreher's article, *"Your Stake in Engineering Education,"* available from the Foundry Education Foundation. In his article Mr. Dreher explains the industry's shortcomings in meeting competition for the cream of the nation's annual crop of engineering school graduates and ways in which these shortcomings may be remedied. Also depicted by the author are the castings market and its future, a brief outline of engineering training for the foundry industry as it exists in U. S. schools today, and the value of the engineering school graduate to the foundry industry. Included in the reprint is a chart showing possible avenues of progress a trainee may follow in the foundry upon completing his program of induction into the industry.

Malleable Castings

NV105—Designed primarily for users or potential users of malleable iron castings is Lake City Malleable Co.'s 92-page cloth-bound volume, *"Shock Proof."* An informal product presentation, *"Shock Proof"* tells the story of malleable's place in industry, interspersing accurate informative technical information with light touches of humor. Contents of the book include sections on grades and uses of malleable, values, applications and specifications. Profusely illustrated with photographs, drawings and diagrams, *"Shock Proof"* is a highly readable presentation of an industry and its products. Single copies are available gratis to readers of AMERICAN FOUNDRYMAN. When requesting *"Shock Proof,"* please write on firm letterhead, giving title or position.

Chain Couplings

NV106—A new 16-page catalog published by the Morse Chain Co., Division of Borg-Warner Corp., describes and illustrates such products as roller chain stock couplings, silent chain stock couplings, and steel and plastic covers for two-stock couplings. Complete information is given on dimension data, horsepower ratings, stock and maximum bores, together with illustrations and descriptive matter.

Gear Engineering Symbols

NV107—A new edition of *American Standard Letter Symbols for Gear Engineering*, sponsored by the American Gear Manufacturers Association and the American Society of Mechanical Engineers, is available at 30 cents per copy from the American Standards Association. A letter symbol is a single letter representing a numerical value in equations and formulas and may deal with design, application, manufacture, inspection or formulation of new methods, according to the publishers.

Permanent Molding

NV108—*"Permanent Molding of Aluminum Bronze,"* published by the Non-Ferrous Division of the Buffalo Pipe & Foundry Corp., is an eight-page illustrated brochure describing aluminum bronze permanent moldings—its applications and advantages. Included in the booklet are sections on casting engineering, sales engineering, quality trial runs, production scheduling and final inspection of castings made by Buffalo's Non-Ferrous Division.

Process Cast Iron

NV109—Bulletin 3A in McNally Pittsburgh Foundries, Inc.'s series of bulletins on process cast iron, *"Process Iron Castings That Solve Your Production Problems,"* describes McNally Pittsburgh's operating control system, characteristics of metals used, casting specifications and equipment used in castings production. This 16-page booklet contains photographs of plant layout and casting processes, plus specification charts for process iron.

Valve Part Names

NV110—The Cooper Alloy Foundry Co. announces the publication of a new bulletin, *"Names of Valve Parts,"* containing diagrammatic sketches of gate, globe, check and lever valves. Also presented is a uniform material and parts identification code. This is the first publication of its type to follow newly proposed standard designations of the Manufacturers' Standardization Committee.

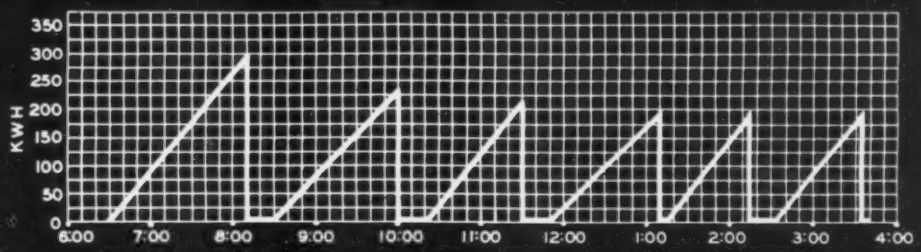
Sand Additive

NV111—Silvacon, a patented product derived from Douglas fir trees by fractionation, is described in a four-page folder issued by the Weyerhauser Timber Co. Used as a foundry sand ingredient, Silvacon, according to the manufacturer, overcomes casting defects, promotes collapsibility, green compression and flowability. Tabulated are the mechanical properties of two types of Silvacon suitable for use as foundry sand ingredients—No. 412 (granular fiber form) and No. 472 (powder form).

Core Sand Mixing

NV112—Werner G. Smith Co.'s newly-issued Technical Bulletin No. 102, *"Core Sand Mixing,"* is the latest in a series of Linoil research laboratory reports dealing with cores and core problems. Described in the report are the effects made on green and baked core strength through changes in mulling times and the order in which ingredients are added to the muller.

DETROIT ROCKING ELECTRIC FURNACE



NOTES ON DAILY OPERATION OF TYPE LFY, 700-LB. CAPACITY DETROIT ELECTRIC FURNACES MELTING NICKEL:

TOTAL HOURS OPERATION—9¼ hrs.; NUMBER OF HEATS—6; WEIGHT PER HEAT—900 Lbs.; TOTAL METAL MELTED—5450 Lbs.; TOTAL KILOWATT HOURS—1323; KILOWATT HOURS PER TON—486.

PROFITS FROM DETROIT ELECTRIC FURNACE OPERATION IN PAST YEAR: $150,000.00.

NOTES ON TWO-YEAR OPERATION OF SAME FURNACES:

COMPANY—A Well-Known Automotive Plant (name on request); PERIOD—(Sept. 9, 1946 to Sept. 18, 1948); TOTAL TONNAGE MELTED—1,070; AVG. ELECTRODE USAGE—8.65 Lbs. per Ton of Nickel at .23/Lb.—$1.99; AVG. POWER CONSUMPTION—625 KWH/Ton at 1¼c—$7.81; AVG. REFRACTORY COST—$4.00/Ton.

AVG. TOTAL MELTING COST OVER TWO YEARS: $13.80 PER TON.

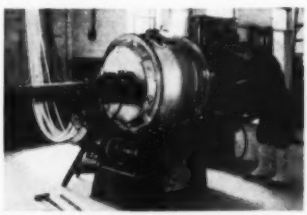
Maximum QUALITY CONTROL • *Low* MELTING COST

FOR FERROUS AND NON-FERROUS METALS

This record is typical of annual savings obtained with Detroit Rocking Electric Furnaces. An important additional advantage is the fine degree of quality control obtained in every melt.

Other economical features are: optimum power use and all-electric operation eliminating handling and storing of messy, bulky fuels; positive control of melting speed, quality and composition; exact duplication of previous melts; and control of other melting factors. Out-of-production time is minimal. Burned-out linings are quickly, easily replaced by spare, previously-lined furnace shells.

Fast, always uniform outputs and low metal losses by shrinkage save production time, labor and expense. Shop borings, turnings and scraps are reduced with least loss from oxidation.



The electric arc is automatically established clear of the molten bath at all times. The metal never becomes a part of the electric circuit. This method assures uniform temperatures within the melting chamber.

Detroit Rocking Electric Furnaces are available with automatic electrode control and automatic rocking control. There is a wide range of sizes to choose from . . . from 10 to 4000-lb. capacities. Chambers are of conical or cylindrical type. All furnaces are individually designed to meet your plant electrical specifications.

Let our engineers send you all the facts on how you reduce melting costs the year around, with the Detroit Rocking Electric Furnace. Send us your pertinent production data and we will show you the ultimate in operating economy and positive quality control with the Detroit Rocking Electric Furnace suited to your requirements in size, use and capacity. Write:

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC CO. • BAY CITY, MICHIGAN

Foreign Representatives: In Brazil—Euipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi, Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32 - Despacho 14. Mexico City, D. F.

FOUNDRY FIRM *Facts*

American Blower Corp., Detroit, has completed negotiations for the construction of a manufacturing and assembly plant at San Leandro, Calif. Plans call for the erection of a 40,000 sq ft masonry and steel building to be ready for operation in January, 1950. The corporation has purchased 10 acres of ground to provide for future expansion.

Whitehead Metal Products Co., Inc., announces the removal of its Newark, N. J., warehouse from 205-211 Frelinghuysen Ave. to 1000 South Fourth St., Harrison, N. J. New warehouse facilities will provide approximately three times as much floor space. E. L. Carey will continue as manager of the warehouse.

Cooper Alloy Foundry Co., Hillside, N. J., announces the appointment of **Wm. G. Boales & Associates,** Detroit, as its Michigan representative. Boales & Associates has served the Detroit area for 20 years as representatives for heating, cooling and related industrial products. The organization will handle the Cooper line of stainless steel valves, fittings, accessories and engineered castings.

Riverside Metal Co., Riverside, N. J., has appointed **International Brass & Copper Co., Inc.,** New York, as its exclusive export agency for its line of phosphor bronze, nickel silver cupro nickel and beryllium copper alloys.

Black, Sivalls and Bryson, Inc., Kansas City, Mo., this year for the third consecutive time won the bronze "Oscar of Industry" presented by *Financial World* for the best annual report of any company in the materials handling industry. The trophy was presented to Company President Arthur J. Smith at an awards banquet held at the Hotel Statler, New York, October 31.

Williamson Heater Corp., Cincinnati, has closed its Greensburg, Ind., foundry for an indefinite period.

Swayne-Robinson & Co.'s branch foundry at Cambridge City, Ind., is preparing to reopen in the near future. The plant has been closed for several months.

G. W. Davis Corp., Richmond, Ind., recently reopened its foundry, which had been closed for several months.

American Manganese Steel Div., American Brake Shoe Co., announces the appointment of **Whitehead Metal Products Co., Inc.,** as distributors for its line of Amsco welding products, which will be handled through Whitehead's warehouses in New York, New Jersey, Pennsylvania, Massachusetts and Maryland.

American Furnace & Foundry Co. and **American Boiler & Foundry Co.'s** gray iron foundry at Milan, Mich., has substantially increased its capacity with completion of a $250,000 plant expansion and equipment improvement program. Started at the end of the war, the program was stepped-up early in the year when the companies became subsidiaries of the **Maumee Malleable Castings Co.,** Toledo. Plant facilities covering 6½ acres produce castings for the automotive, tractor, laundry equipment, machine toll and heating industries. Recently completed are a building housing systematic pattern storage vaults; blast equipment for short-cycle cleaning of castings, and completely modernized offices. The 30-year-old foundry now has a modern 15-ton-per-hour cupola and mixing ladle, and an auxiliary cupola with a 9-ton-per-hour capacity. Fifty machine, bench and squeezer molding floors are operated with mechanical in-plant equipment to transport castings from molding floors to core knockout, cleaning, finishing and shipping departments.

Monsanto Chemical Co. announces the removal of its Chicago offices to the Merchandise Mart Bldg., Chicago 54.

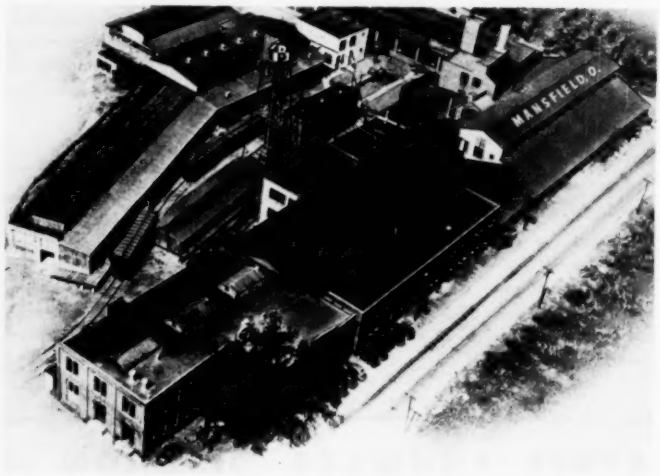
Non-Ferrous Perma Mold, Inc., Mansfield, Ohio, jointly owned by the **Barnes Mfg. Co.** of Mansfield and the **Non-Ferrous Die-Casting Co., Ltd.,** of London, England, is a new company incorporating many techniques in permanent mold casting new to the United States. The new company has a number of technicians prominent in British permanent mold casting fields. The advantages of British techniques in design, manufacture and casting guarantee low mold cost for economical production of both long and short runs of precision castings, and the material range adaptable to permanent mold casting has been extended to include metals of straight 60/40 brasses on up through ranges to high-tensile manganese brasses and aluminum bronze, according to Company President Millard Pryor.

American Machine & Foundry Co., has acquired the Union Machinery Co., Joliet, Ill., manufacturers of bakery equipment.

American Brake Shoe Co. announces expansion of its Hawthorne Plant with construction of a new building at 4520 West 26th St., Chicago.

Wilkens-Anderson Co., Chicago, recently moved its home offices to 111 North Canal St., Chicago.

Sales of the **American Brake Shoe Co.,** New York, amounted to $53,459,897 during the six months ending June 30, it is announced by American Brake Shoe President William B. Given, Jr.



Non-Ferrous Perma Mold, Inc., newly-formed company for manufacturing of copper-base alloy castings by British permanent mold methods, has located its offices and plant in these buildings at Mansfield, Ohio.

LINE-UP TROUBLES DISAPPEAR
with UNIVERSAL
FLASK PINS AND BUSHINGS
FOR COPE AND DRAG
Accurate and speedy lineup of cope and drag, saving valuable production minutes, is the experience of the foundry that uses Universal Flask Pins and Bushings. Once installed, they *maintain their stability and accuracy* for hundreds of castings. Cope Bushings are quickly guided to Drag Pins over tapered, loose-fitting Closing Pins which are easily removed after assembly. The special elongated flask bushing permits longitudinal expansion to compensate for metal heat *without affecting accurate alignment.* Universal Flask Pins and Bushings are available from stock in standard sizes for iron, steel, aluminum and magnesium flasks. Special sizes and types to order. Send for folder and complete information.
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 12, MICHIGAN

NEW Foundry Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the item by means of the convenient code numbers.

Balance

NV1—Fisher Scientific Co.'s Gram-Atic balance weighs for sulphur, silicon, copper, vanadium, molybdenum and other tests to 1/20 milligram in less than one-third the usual time required, according to the manufacturer. The new balance has only one pan and the weight reads

directly on a scale at eye level. All required weights are built-in and are manipulated by turning four external knobs. No weights are handled and weights less than 0.1 gram are indicated optically and automatically. Total weight is read directly from a scale on the instrument panel. Samples to be weighed can range from 200 grams to 0.0001 gram.

Rockwell Hardness Tester

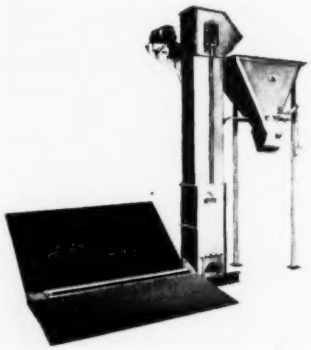
NV2—An improved Rockwell hardness tester featuring a spindle housing and beam assembly easily replaceable without the use of special skills or tools is announced by Clark Instrument, Inc. Other advantages include frictionless spindle, more positive tripping, and exceptionally light weight. Can be used for Rockwell testing of hard or soft steel, brass, aluminum, cast iron, copper and other metals and plastics. Body of the tester is cast in aluminum and weighs from 65 to 85 lb less than similar units made from steel or cast iron, manufacturer claims.

Gas-Liquid Analyzer

NV3—A gas and liquid analyzer for use in measuring atmospheric contaminations and for process control, is announced by the Mine Safety Appliances Co. This Luft-Type Infra Red Analyzer detects minute as well as heavy concentrations of atmospheric contaminates and may be made selective so as to measure one specific product in the presence of several. This feature makes the Lira unit valuable for process control. In addition to its application for gas or air analysis, the instrument may also be used for liquid analysis. Unit operates on principle that most gases, vapors and liquids will absorb infra red light in a portion of the spectrum which is specific for each product. There is a particular wave length of infra red light which is absorbed by each product and this instrument uses that phenomena to detect a specific product in either a simple or complex mixture.

Sand Handling System

NV4—A packaged unit foundry sand handling system for individual floors, introduced by Newaygo Engineering Co., makes it unnecessary for the molder to shovel sand into the mold or flask. When overhead handle is pulled, sand drops directly into flask located under self-closing sand gate. The "Handy Sandy"



unit requires no pit or foundation and can be placed in several positions with relation to bench or molding machine. Conditioned sand is deposited over the feeder or can be discharged into the feeder from a portable sand conditioner. Feeder delivers sand to bucket elevator which carries it to aerator. Aerator discharges ready-to-use sand into hopper over bench or molding machine. As hopper empties, molder pushes button to refill it from heap. Only one motor operates entire unit. Headroom requirements are low. Hand draw bin is optional equipment. Unit can also be used to advantage in core rooms to provide overhead handling and storage to core benches and blowers, manufacturer states.

Tramrail Crane

NV5—An improved tramrail of floating suspension design engineered for greater strength-to-weight ratio is an-

nounced by the Forker Corp. Features claimed for the Ohio Tramrail crane are greater hook load capacity, reduced drawbar pull, increased payload capacity, swiveling crane end trucks and flexibly suspended runways that eliminate possibility of binding, and maximum headroom. Cranes are available for all makes of chain and electric hoists with the bridge hand-pushed. By addition of standard motor heads to crane end trucks or crane trolleys, various combinations of motor-propelled equipment are available. Crane may be easily converted to transfer bridge by addition of 100 per cent foolproof interlocks.

Battery Charger

NV6—A universal battery charger, for charging any type of industrial truck battery, is announced by the Motor Generator Corp. Designed to charge 200 to 500 ampere hour lead-acid batteries of 12, 15, 16 and 18 cell capacity, the unit will also charge 150 to 450 ampere hour nickel-iron batteries of 20, 24, and 30 cell capacity. Actual charge is controlled by Hobart Y-500 charge control, which automatically disconnects battery from charger in time preset by controls.

Check Valve

NV7—A cupola blast line check valve, developed jointly by the Whiting Corp. and the Norwalk Valve Co., is designed to prevent the accumulation of explosive gases in blast line, blower and blower room, providing maximum safety. Recommended and approved by Factory Mutual Laboratories. Complete information and dimensions available upon request.

FOR FASTER PRODUCTION OF...

Better, Cleaner Castings

STEEL, MALLEABLE, GREY IRON, NON-FERROUS USE...

DELTA CORE & MOLD WASHES

Three easy-to-understand reasons why more foundries use DELTA Core and Mold Washes . . .

1. MORE PERFECT CASTINGS . . . 2. LOWER CLEANING ROOM COSTS . . . 3. LESS SCRAP IN MACHINING.

HERE'S WHY...

a. Delta Core and Mold Washes "Anchor" themselves by penetrating from 3 to 5 grains deep into the sand. This bond between the wash and the sand . . . a distinctive DELTA characteristic . . . produces an expansion-resisting coating essential to the production of finer finished castings.

b. The hot strength of Delta Core and Mold Washes increases with each degree of temperature rise from 1800°F to 3000°F providing maximum critical hot strength for all foundry applications.
The higher hot strength of DELTA Core and Mold Washes eliminates surface sand fissuring, excessive sand expansion and distortion.

c. No gas leakage through Delta Core and Mold washed surfaces. Gases produced by decomposition of organic binders in the core sand cannot leak through Delta Core and Mold washed surfaces to contact the molten metal. Only Delta Core and Mold Washes provide this unique and all-important insurance against defective castings resulting from core gas leakage. DELTA Core and Mold Washes insure more perfect castings with finer finished surfaces.

DELTA CORE & MOLD WASH-BASE
Mix with silica flour and water to produce finished wash.

•

FOR STEEL
STEELKOAT — Special Core and Mold Wash.

•

FOR GREY IRON & MALLEABLE
Grakoat — Blackoat — Hi-temp.

•

FOR NON-FERROUS METALS
Non-FerrusKoat.

•

FOR ALL SAND CAST METALS
THERMOKOAT — It's Plasti-Lastic.
PYROKOAT-Hi-Speed.

•

FOR UNUSUALLY HIGH TEMPERATURE CONDITIONS
Z-KOAT-High-fusion-temp wash.

•

• *Ask for a liberal working sample.*

There is no "just as good" substitute for any DELTA Core and Mold Wash just as there is no substitute for DELTA'S scientific laboratory control of production which safeguards the quality and uniformity of all DELTA Foundry Products. DELTA Research laboratories developed, and pioneered the use of, Plastic-type Core and Mold Washes . . . and still leads the field in the development of new products for improved foundry practices.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

Ridiculous—sure . . .

BUT YOUR DUST CONTROL SYSTEM COULD BE EQUALLY INEFFICIENT

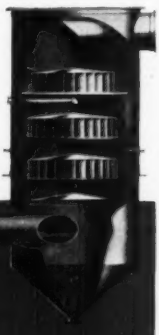
Naturally a charwoman is out of place in the foundry . . . but so is obsolete dust and fume control equipment.

If your personnel problems are mounting . . . your efficency down . . . production costs up . . . look out into your foundry . . . can you slice the air with a knife? If so—there's your answer . . . poor foundry ventilation.

Schneible engineers have not only specialized in Dust and Fume Control equipment but pioneered important new developments in Foundry Ventilation Control.

It will pay you to call us in on your problem. A Schneible representative is as close as your telephone.

MULTI-Wash COLLECTORS
Model HC—1500 to 30,000 c.f.m. or multiple units for larger capacities.
Model JC—1000 to 30,000 c.f.m. or in multiple units, if greater capacity desired.



CLAUDE B. SCHNEIBLE COMPANY
P. O. BOX 502 • DETROIT 32, MICHIGAN

U. S. and Foreign Patents Pending

SCHNEIBLE

CHAPTER ACTIVITIES

(Continued from Page 79)

tices to enable foundrymen to determine causes of defects from melting; (2) establishment of sand controls; (3) proper gating of castings to prevent metal agitation or spinning, which causes cutting action on sand grains; and (4) proper risering of castings, so that riser feeds casting at the critical point.

The meeting closed with an interesting question and answer session.

Rochester

Donald E. Webster
American Laundry Machine Co.
Chapter Reporter

FALL AND WINTER meetings began with a dinner meeting at the Hotel Seneca, October 11. The meeting was devoted to nodular iron, with Gilbert L. Cox, International Nickel Co., New York, as speaker. Mr. Cox, a member of the Rochester Chapter, in his position with the Development and Research Div. of International Nickel has been closely allied with that Company's development of suitable magnesium containing alloys.

Mr. Cox discussed at some length the typical nodular, or spherulitic, type of graphite, and its effects on the physical properties of cast iron. A series of slides, and a group of castings and test pieces demonstrated further the properties of this interesting new development.

The tensile strengths obtained with nodular iron, and its response to various heat treatments, together with the ductility developed, were discussed. The type of iron required for treatment to produce the nodular structure, and the roles of phosphorus, sulphur, silicon and carbon were covered by Mr. Cox.

The question period following the talk showed that foundrymen are keenly interested in the subject of nodular iron. Not only in the details of production and control, but in the position these irons may occupy in industry in the future.

Central New York

John A. Feola
Crouse-Hinds Co.
Publicity Chairman

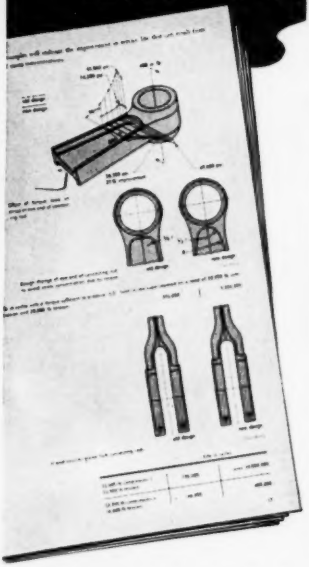
THE OCTOBER MEETING, held at the Mark Twain Hotel, Elmira, was attended by 105 members and guests.

Chairman J. F. Livingston, Crouse-Hinds Co., presided and introduced the speaker, Harry J. Jacobson, Industrial Pattern Works, Chicago, who spoke on *"Core Box Design and Rigging for Core Blowing."*

Mr. Jacobson opened with the state-

a new bulletin
COMPLETELY ILLUSTRATED!
8 PAGES . . . PACKED WITH INFORMATION
THE NITE-GANG
FOR COMPLETE SAND CONDITIONING
on a new machine
SEND COUPON FOR COPY
ANOTHER BETTER METHOD by BEARDSLEY & PIPER
the NITE-GANG
Completely conditioned sand at lowest cost per ton with the revolutionary new Nite-Gang! An outstanding development in sand conditioning equipment, this mobile self-feeding machine blends, magnetically separates, screens, double aerates and windrows or piles the sand. The Nite-Gang entirely eliminates all of the laborious manual operations formerly involved in the floor cutting of foundry sands and provides complete, effortless conditioning of up to forty tons of molding sand an hour. The coupon below will bring the 12 page Nite-Gang bulletin containing full information on this new machine.
Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmuller • Mulbaro • Screenerator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen
send coupon now!
BEARDSLEY & PIPER
Division of Pettibone Mulliken Corporation
2424 North Cicero Avenue, Chicago 39, Illinois
Send Nite-Gang Bulletin
Have B&P Representative Call
FOUNDRY
ATTENTION
TITLE
ADDRESS
CITY
ZONE
STATE

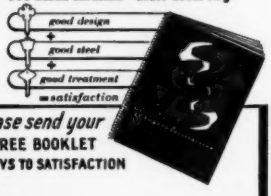
WHAT ABOUT STRESS RAISERS?
This book gives the answers..



How to avoid the localized stresses which start failure is a basic problem of design. This 72 page booklet analyzes many good and bad features of design. It also deals with problems of steel selection and treatment from the viewpoint of the design engineer —instead of the metallurgist.

Write for "3 Keys to Satisfaction"—it is free.

Climax Molybdenum Company
500 Fifth Avenue · New York City



Please send your
FREE BOOKLET
3 KEYS TO SATISFACTION

Name.....
Position.....
Company.....
Address.....

AF11 F21

ment that "Core blowing has been one of the prime factors in the change of the foundry industry from handcraft to machine-craft."

Using slide pictures, the speaker showed the various methods used in rigging core boxes for blowing machines. He also stressed the necessity for periodic checks on equipment to prevent cores being made that will not meet specifications.

A lively discussion period followed Mr. Jacobson's talk. He also showed several types of core boxes that were rigged to run on blowing machines.

A.F.S. National Director L. D. Wright, U. S. Radiator Co., Geneva, program chairman for the New York State Regional Foundry Conference, announced the committee's selections for the two-day sessions and asked for the support of those present.

Ontario

C. H. Johnston
E. Long, Ltd.
Chapter Reporter

THE INITIAL MEETNG of the 1949-50 season was held at the Connaught Hotel, September 30. Chapter Chairman J. H. King, Werner G. Smith Co., Ltd., Toronto, presided.

Following dinner, the meeting was divided into three groups—non-ferrous, steel and gray iron.

The non-ferrous group, under Chairman O. A. Davies, Canada Metal Co., Ltd., Toronto, heard an interesting talk on manganese bronze by Morris Davidson, also of Canada Metal Co., Ltd., Toronto.

H. H. Fairfield of Wm. Kennedy & Sons, Ltd., Owen Sound, acted as chairman and discussion leader for the steel group. Mr. Fairfield showed a number of castings and discussed their defects at the session.

The gray iron group met with L. B. Morris, Gurney Foundry Co., Ltd., Toronto, chairman, assisted by Peter Gordon, I. R. Short (Canadian Mills) Ltd., Toronto, and G. Kelly, Gurney Foundry Co., Ltd. The talk was on sand problems and an interesting discussion followed on the mixing of facing sand for jobbing foundries.

Twin City

J. D. Johnson
Werner G. Smith Co.
Chapter Reporter

SPEAKER at the October 11 meeting, held at the Covered Wagon, Minneapolis, was William B. George, R. Lavin & Sons, Inc., Chicago.

Discussing the cost of producing brass and bronze castings, Mr. George stated that some brass foundries bid on jobs by guesswork or by basing their estimates on costs of similar jobs and then underbidding. As a result, the speaker said, these foundries are either losing money on the job or are submitting bids too high to get the job.

The speaker showed methods of figuring costs based on casting yields, and showed why it may cost twice as much to produce some brass castings as others. This discussion was of utmost importance to foundrymen because of today's competitive market.

A second part of Mr. George's talk dealt with making pressure-tight castings of brass and bronze. The answer to this problem is directional solidification, Mr. George said, but only a half-dozen foundries, or less, in the country use this solution. Mr. George concluded his talk by answering many questions from the floor.

Saginaw Valley

Kenneth H. Priestley
Vassar Electroloy Products, Inc.
Chapter Reporter

OPENING THE CHAPTER'S 1949-50 season was a dinner and technical meeting held October 8 at Fisher's Hotel, Frankenmuth, Mich. Designated "Company and Sustaining Members' Night," the meeting was attended by some 200 members and guests, including A.F.S. Honorary Life Members of the Saginaw Valley area, who attended by special invitation.

Speaker for the technical program was William A. Hambley, Wilson Foundry & Machine Co., Pontiac. Mr. Hambley used slides to illustrate his talk on *"Casting Defects."*

The speaker pointed out that a defect must be diagnosed as to type before correcting it, and stressed the difference between shrinks and blows. Mr. Hambley is chairman of the A.F.S. Casting Defect Committee, and is well qualified to handle this subject. His talk was followed by a discussion.

Central Ohio

H. W. Lownie, Jr.
Battelle Memorial Institute
Chapter Reporter

ABOUT 60 MEMBERS met at the Chittenden Hotel, Columbus, on October 10 for dinner and a technical meeting.

Dr. O. E. Harder, formerly assistant director, Battelle Memorial Institute, reviewed highlights of developments in the foundry industry during the last 30 years, and predicted avenues which further developments can be expected to take. In steel casting, further improvements in practice will likely be along lines of improved deoxidation practice and better control of inclusions. The use of a small amount of several different alloying elements in order to obtain maximum effect from a small total alloy addition will probably also continue to play an important part in steel casting.

Dr. Harder stated that much of the

future development in gray iron will undoubtedly be based on improvements in practice and techniques for producing the nodular-graphite structure. Alloys can be expected to be widely used for controlling the nature and properties of the matrix of gray irons. Recent developments and possible future activities in the fields of malleable cast iron, heat and corrosion resisting alloys, copper-base alloys, light-metal castings, centrifugal castings, and precision castings were also discussed.

Another feature of the meeting was a sound movie entitled *"Men and Molds."* This film described and illustrated many of the molding and melting practices in use at the Lynchburg Foundry Company, Lynchburg, Va.

Cincinnati
John F. Kohles
University of Cincinnati
Chapter Reporter

SEPTEMBER 12 MEETING, held at Engineering Society Headquarters, Cincinnati, featured R. B. Kropf, International Nickel Co., New York, as speaker on *"Ductile Cast Iron."*

Nodular iron, Mr. Klopf said is "a new engineering material combining the process advantages of cast iron with the product advantages of cast steel. Closing the gap between cast iron and cast steel, this material is characterized by a graphite structure wholly in the form of spheroids.

"The process for making this new material," the speaker continued, "is based on the introduction of an effective amount of magnesium into iron. Its excellent physical properties, particularly its high elastic modulus, high yield strength and high ductility, suggest its suitability for many applications heretofore considered beyond the scope of cast iron."

Mr. Klopf showed slides indicating the characteristics of the material and some of its applications, and speculated upon possible applications suggested by available combinations of physical properties in the various metallurgical structures obtainable in magnesium-treated cast iron.

Western New York
Roger E. Walsh
Hickman, Williams & Co.
Chapter Secretary

SPEAKING ON *"Cost Analysis and Control,"* Peter F. Rossman, Symington Gould Corp., Depew, N. Y., was the featured speaker at the October 7 meeting, held in the Sheraton Hotel, Buffalo, and attended by 115 members and guests.

Mr. Rossman said that fundamental considerations in controlling costs are: (1) a minimum of reports and paper-

"FALLS BRAND" ALLOYS
AMERICA'S LARGEST PRODUCERS OF ALLOYS

"FALLS" FLUX "A"
for
ALUMINUM

"FALLS" FLUX "A" will reduce melting costs because it will efficiently separate the dross from molten aluminum thereby reducing rejections and scrap that are caused by dirty metal:—

. . . **cleans, fluxes and removes gases, oxides and non-metallic impurities from all grades of aluminum.**

. . . **increases the metal yield about 3% because it puts all the metal usually lost in the dross back into the molten metal.**

. . . **does not smoke, fume or smell.**

. . . **is a dry white powder that will not absorb moisture and it can readily be handled with the bare hands without burning the skin.**

WRITE FOR COMPLETE DETAILS

NIAGARA FALLS
Smelting & Refining Division
Continental Copper & Steel Industries, Inc
BUFFALO 17, NEW YORK

Do You Know?

You can speed production up to 600%.... ....cut costs 75% with ...

TAMASTONE

THE PERFECT PATTERN COMPOUND

Write for facts!

Tamms Industries, Inc.

228 N. La Salle St., Chicago 1, Ill.

Foundry Sand Testing HANDBOOK

A foundryman may select his scrap with the greatest of care. His melting procedure may check with the most advanced practice. And he may exercise full control over his methods. **BUT** . . . he cannot consistently produce sandcastings in molds prepared from uncontrolled sand mixtures.

A casting is only as good as the mold . . . that's why the **A.F.S. FOUNDRY SAND TESTING HANDBOOK** is a "must" for the foundryman's library. Order your copy today: **$2.25 to A.F.S. Members; $4.00 List Price.**

AMERICAN FOUNDRYMEN'S SOCIETY

222 W. Adams St., Chicago 6

work, (2) explanation of tax charges to shop personnel, (3) control of expenses before spending money, and (4) explanation of cost control principles to employee organizations.

Material handling should be thoroughly studied, Mr. Rossman said, since the moving of only one brick involves cost. Snobbishness, he continued, should be eliminated by making executive and supervisory personnel get out into the shop and learn the business.

There are two kinds of overhead, Mr. Rossman said,—fixed and variable, and the break-even point changes as production varies.

Following Mr. Rossman's talk, the Malleable Founders' Society film, "This Moving World," was shown by Earl Strick of the Erie Malleable Iron Co., Erie, Pa. The Chapter wishes to thank Mr. Strick for the opportunity to see this interesting film.

Metropolitan

Carl Szego
Moldcast Products, Inc.
Publicity Chairman

THE OPENING MEETING of the 11th year of the Metropolitan Chapter was addressed by Clyde A. Sanders of the American Colloid Co., Chicago, whose subject was *"Does Sand Cause Metal Shrinkage?"*

After his introduction by George Watson of the American Brake Shoe Co., Mahwah, N. J., Mr. Sanders presented a lively discussion describing the extensive work he has done on the relationship of grain size and permeability of molds to casting defects.

The principal theme of Mr. Sanders' talk was the decrease of shrinkage in castings with increase in density of the sand. This increase in density can be brought about by harder ramming in sections which tend to shrink, thereby decreasing the percentage of highly insulating air in the mold.

Although agreeing with Mr. Sanders' overall results, members of the Chapter took exception with some of his theories and results, giving rise to a detailed and highly enlightening discussion period after his talk.

Northwestern Pennsylvania

Fred Carlson
Weil-McLain Co.
Acting Chapter Reporter

THE FOURTH ANNUAL picnic was held at Tyman's Grove, Erie, September 17. Following a golf match in the morning at the Lake Shore Golf Club, 150 members enjoyed a smoked whitefish lunch at the Grove.

The afternoon was devoted to fellowship, stunts and games, including an egg-tossing contest. Some 50 prizes were given out for the various events.

Bailey Herrington, Hickman, Williams & Co., won a set of golf clubs for low score of the day. The afternoon's activities were followed by a delicious ham dinner.

Canton District

Alexander Prentice
Stark Foundry Co.
Chapter Reporter

THE OPENING MEETING of the season was held October 6 at the Mergus Restaurant, Canton, with 65 members and guests in attendance.

C. T. Haller, International Nickel Co., Pittsburgh, spoke on *"Spheroidized Iron,"* explaining how it is possible to increase the tensile strength of high-quality iron from 30,000 psi to 120,000 psi and also to obtain elongation by ladle additions of nickel-magnesium. Mr. Haller's talk was illustrated with slides showing photomicrographs.

H. V. Beasley, also of International Nickel Co.'s Pittsburgh office, assisted Mr. Haller in the general discussion which followed. It was interesting to note that nodular iron has many characteristics common to both malleable iron and low-carbon steels.

Rochester

Donald E. Webster
American Laundry Machine Co.
Publicity Chairman

THE ANNUAL PICNIC, held at Barnard's Exempt Firemen's Club, September 17, opened the Chapter's fall and winter season. There were about 200 in attendance, including a number from Buffalo, Syracuse and Painted Post.

The Picnic Committee, headed by Co-Chairmen Donald H. Rishor, Geo. F. Pettinos, Inc., and Herbert Stellwegen, Hetzler Foundries, Inc., planned an afternoon of games, contests and races, in which participation was stimulated by a long list of valuable and useful prizes donated by local foundries and foundry supply firms.

Another highlight of the afternoon was a bountiful array of clams, hot dogs, barbecue and other refreshments.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Reporter

OPENING THE 1949-50 season, the Chapter met in the Blue Room of the Moose Club, Erie, September 26, with more than 100 members and guests attending. Chairman Joseph A. Shuffstall, National Erie Corp., Erie, presided and opened the meeting by paying tribute to Chairman Fred J. Carlson-Weil-McLain Co. Erie, and his committee for the fine job they did in arranging the Chapter's Annual Picnic.

Lester White, for 21 years a molder at the National Erie Co. and newly-crowned Erie amateur golf champion,

(Continued on Page 92)

A. F. S. Employment Service

To contact "Help Wanted" or "Position Wanted" advertisers, write to American Foundrymen's Society, 222 West Adams St., Chicago 6, designating item number and issue of AMERICAN FOUNDRYMAN in which advertisement is published.

HELP WANTED

HW513—Excellent opportunity for experienced core oil and foundry supply salesman in State of Ohio, north of Dayton, excluding Cleveland. Drawing account with liberal commission on complete line of core oils, facings, supplies and equipment.

HW514—Foundry Superintendent. Modern non-ferrous production; must be conversant with nickel, monel and bronze castings. Write, giving qualifications.

HW515—Steel Molding Superintendent. Texas Electric Steel Casting Co., the largest steel foundry on the Gulf Coast, needs an experienced supervisor, capable of directing molding, core room and pouring of large, high-pressure steel castings in a modern foundry. Latest methods employed throughout foundry. Must be capable of maintaining high standards of quality established by TESCO. The man we need must be practical, preferably with a technical background or technically inclined. Prefer man accustomed to supervising men on incentive plan. Must be able to handle workers. Job is permanent for the man who can qualify and produce. Write Texas Electric Steel Casting Co., Houston, Texas.

POSITIONS WANTED

PW119—Sales/Production: Recent metallurgical engineering graduate from large Midwestern university. Veteran, 26, married, two children. Have a little gray iron experience. Desire start in sales or production that will lead to responsible position in company that promotes from within. Available now.

PW120—Manager/Gen. Superintendent. Top flight gray iron foundry manager or general superintendent. Thirty years' experience in production, rigging, plant layout and methods, research work, inventions and modernization. Ten years' experience with Meehanite metal, sales, customer contact, design and engineering. Available only to progressive foundry, light or heavy castings in gray iron or high physical property metals.

PW121—Foundry Metallurgist. B. S. degree in metallurgical engineering. Seven years' experience in development work and foundry production problems. Desires position in foundry production and control. Familiar with cast iron, steel and non-ferrous foundry work, heat treating and testing. Some sand and core testing experience.

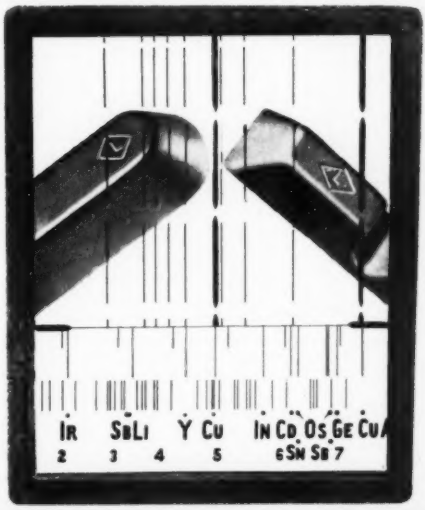
PW122—Gray Iron Foundryman. Age 49, U. S. citizen. Practical and technically trained. Commercial jobbing. Production automotive. Thirty-two years experience. Thoroughly capable of assuming executive responsibility. Excellent reference. Salary expected: $12,000, plus bonus.

ALUMINUM FOUNDRY
FOR SALE
Unusual opportunity. Complete, modern 4,500 sq. ft. Six squeezers, 2 roll-overs, 4 permanent mold machines, 8 natural gas furnaces, etc. Ideal Indiana small town location. Bargain.
Box 902, American Foundryman
222 West Adams St., Chicago 6, Ill.

Harold J. Roast
F.I.M., F.C.S., M.E.I.C.
BRONZE FOUNDRY CONSULTANT
15 Church Hill, Westmont 6, Que., Canada
Available Coast to Coast

Lester B. Knight & Associates, Inc.
Consulting Engineers
Management • Sales • Production • Surveys
Modernization • Mechanization
600 West Jackson Blvd., Chicago 6, Ill.
30 Church St., New York 7, N. Y.

CASADONTE RESEARCH LABORATORIES
Chemists, Metallurgists, and
Foundry Consultants
Complete Testing Facilities
2410 Lake Ave. N. Muskegon, Mich.



Controlled Refining . . .

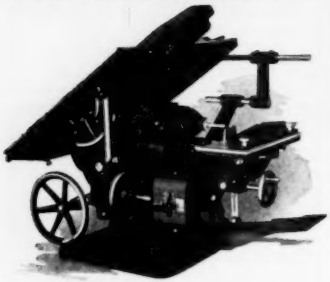
Spectrographic, chemical and metallurgical control insures scientifically refined quality ingot. Lavin's rigid standards begin with the selection of raw materials . . . continue through the refining operations under constant technological and laboratory checking . . . and are completed only after sound castings are produced.

If you have a troublesome non-ferrous casting problem consult our foundry engineers and metallurgists . . . they are ready to serve the Foundryman without obligation.

Specify
LAVIN NON-FERROUS INGOT
Quality

R. LAVIN & SONS, INC.
Refiners of Brass, Bronze and Aluminum
3426 SOUTH KEDZIE AVENUE • CHICAGO 23, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

"OLIVER"
VARIETY
SAW BENCH



Saves valuable time for your pattern makers

This sturdy, smooth-running "Oliver" Saw Bench rips, cross-cuts, dadoes, etc. Cuts a perfect miter quickly and accurately. Has wide capacity. Dadoes up to 4" wide. Carries saws up to 18" diameter. Table tilts 45°, has 4" vertical adjustment. New saw guard offers utmost safety. Mortising and boring attachment available. Precision built, easy to operate.

Write for Bulletin No. 80D

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

SCIENTIFIC MATCH PLATES
Pressure Cast

1. The finest quality Matchplates ever produced in our history!
2. Fast delivery of ordinary plates in from 4 to 6 days!
3. At prices only *slightly* higher than *12 years ago!*

The SCIENTIFIC
CAST PRODUCTS Corp.
1388-1392 EAST 40th STREET
CLEVELAND 3, OHIO
2520 WEST LAKE STREET
CHICAGO 12, ILLINOIS

Quantity
PRODUCTION
of
GREY IRON CASTINGS
*
ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES
*
ESTABLISHED 1866
THE WHELAND COMPANY
FOUNDRY DIVISION
MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE

CHAPTER ACTIVITIES

(Continued from Page 90)

was introduced. Mr. White said that the follow-through he developed with a molder's shovel was a great help to his golf game.

Jack Durr, formerly of the Albion Malleable Iron Co., Albion, Mich., and a director of the Central Michigan Chapter, and now with the Erie Malleable Iron Co., was welcomed into the Northwestern Pennsylvania Chapter.

The speaker of the evening was Wm. Ball, R. Lavin & Sons, Inc., Chicago, who spoke on "*The Effective Essentials Required in Making Castings.*" Mr. Ball said that the three primary requisites in the making of castings are men, machines and materials.

Other essentials for making good castings mentioned Mr. Ball were good pattern and molding equipment, good metal and a thorough study of its behavior and characteristics, sand and sand control, and, above all, good handling of men.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

FIRST MEETING of the 1949-50 season, held at the Hotel Patten, Chattanooga, September 23, featured Bruce L. Simpson, National Engineering Co., Chicago, speaking on "*The History and Development of the Metal Castings Industry.*"

Mr. Simpson said that although the foundry industry does a good job in making castings, it does a poor job of selling itself. The foundry, he said, is one of the oldest industries and has done so much for civilization that every foundryman should make an effort to sell the public on what it has done and is doing.

Mr. Simpson traced the history of the foundry industry from its beginning up to 1900. He described the casting of copper, bronze and iron among ancient peoples. Fins, a casting defect, puzzled early foundrymen as to what to do with them. Finally, he said, they made ornaments out of them, adding to the casting's beauty.

Mr. Simpson traced the industry's history back to the ancient Chinese, Egyptians and Greeks, showing slides of equipment, methods and products. He told how he had x-rayed the foot of an ancient casting and found it filled with sand—and, he added, castings were then sold by the pound!

The speaker showed the development of foundry practices through the centuries and explained how each improvement was probably discovered.

He cited the writings of the early Italian foundryman, Vannoccio Biringuccio, and told of the marvelous castings of ancient times, such as King Solomon's swimming pool and the Colossus of Rhodes.

Slides were shown on the making of cannon, firebacks and stoves. Ray Frings, National Engineering Co. representative in the Chattanooga area, ran the slides for Mr. Simpson, whose talk was excerpted from his book, DEVELOPMENT OF THE METAL CASTINGS INDUSTRY, published by the American Foundrymen's Society.

Eastern New York

George E. Danner
American Locomotive Co.
Publicity Chairman

THE 1949-50 SEASON got under way September 20 at Circle Inn, Lathams, N. Y. The principal speakers were Norman J. Henke and William J. McCarthy, both of Saginaw Malleable Iron Plant, Central Foundry Div., General Motors Corp. Their subject was *"Better Methods Applied to Foundry Operations."*

The speakers brought their own equipment to demonstrate the making of small cores. Throughout the demonstration, Mr. McCarthy actually made the cores as directed by Mr. Henke, who pointed out how these various operations could be improved.

It was evident that motion time analysis and better fixtures greatly improve the coremaker's output and at the same time take the fatigue out of the job.

An interesting sidelight to the talk was the statement that the wage rates for General Motors Corp.'s Saginaw Malleable foundry are set on the basis of these motion time analyses.

Quad City

R. E. Miller
John Deere Planter Works
Publicity Chairman

THE OCTOBER MEETING featured a technical talk by Bradley H. Booth, Carpenter Bros., Inc., Milwaukee, speaking on *"Production and Uses of Foundry Sands,"* and a coffee talk on football by Bob Austin, a football, baseball and basketball official. The meeting was attended by 125 members and guests.

Mr. Booth explained the various types of foundry sand and where they are found, from Albany, N. Y., to Ottawa, Ill. Handling, equipment and drying facilities of each pit were discussed by the speaker.

Mr. Booth emphasized the need for sand uniformity, and stated that sand ramming is the greatest variable, since it controls both permeability and green strength. Sample cylinder surface is

(Continued on Page 98)

LESTER B. KNIGHT & ASSOCIATES, INC.
Consulting Engineers

600 WEST JACKSON BLVD., CHICAGO 6, ILLINOIS
30 CHURCH STREET, NEW YORK 7, NEW YORK

CONSULTING SERVICE
for Management • Sales • Production

ENGINEERING SERVICE
for Surveys • Modernization • Mechanization

An A. F. S. Publication . . .

Recommended Practices for NON-FERROUS ALLOYS

Information contained in this important A.F.S. publication has been compiled by the Recommended Practices Committee of the A.F.S. Brass and Bronze Division, and the Committees on Sand Casting of the A.F.S. Aluminum and Magnesium Division. A book that provides non-ferrous foundrymen with accurate, up-to-date data for the production of practically any non-ferrous alloy casting, and enables them to check present production practices against accepted standards and wide experience. An indispensable reference work wherever non-ferrous metals are cast . . . compiled by many leading foundrymen and metallurgists. Contains 159 pages, 42 tables, 35 illustrations; cloth bound.

$2.25 to A.F.S. Members

ORDER YOUR COPIES PROMPTLY!

Some of the VALUABLE INFORMATION in this book . . .

Molding Practice . . . Finishing Practice . . . Melting and Pouring . . . Heat Treatment . . . Causes and Remedies of Defects . . . Properties and Applications

For the following alloys:

• Leaded Red and Leaded Semi-Red Brasses. • Leaded Yellow Brass. • High-Strength Yellow Brass and Leaded High-Strength Yellow Brass (Manganese Bronze). • Tin Bronze and Leaded Tin Bronze. • High-Lead Tin Bronze. • Leaded Nickel Brass and Bronze Alloys (Silicon Bronze). • Aluminum Bronze. • Aluminum-Base Alloys. • Magnesium-Base Alloys.

a major role in foundry operations is played by...

QUALITY DOUGHERTY LUMBER

FLASK LUMBER • BOTTOM BOARDS • PATTERN PINE MAHOGANY • PLYWOOD FLASKS • SKIDS • PALLETS FILLETS • DOWELS • ROLLERS CRATING LUMBER

• Capable! Dependable! Dougherty has complete facilities and the right background for successfully handling foundry problems.

MID-AMERICA'S LARGEST LUMBER SUPPLIER . . .

Diamond 1200

DOUGHERTY LUMBER CO.

Cleveland 5, Ohio

Prompt shipment—unlimited quantities now available to foundries from BAROID—the world's largest producer of Bentonite. Our modern plants are geared to fulfill every requirement of the foundry trade.

From THESE APPROVED DISTRIBUTORS

American Cyanamid Co.
New York, New York

The Asbury Graphite Mills, Inc.
Asbury, New Jersey

Barada & Page, Inc.
Kansas City Missouri (main office)
Also—(Branches)
Tulsa, Okla.
Oklahoma City, Okla.
Wichita, Kansas
Dallas, Texas
Houston, Texas
New Orleans, La.

G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Canadian Industries, Ltd.
Montreal, Quebec, Canada
(all branches)

Casco S. de R. L.
Mexico, D. F.

The Foundries Materials Co.
Coldwater, Michigan
Also Detroit, Michigan

Foundry Service Company
North Birmingham, Alabama

Foundry Supplies Co.
Chicago, Illinois

Thomas H. Gregg Company
Milwaukee, Wisconsin

Independent Foundry Supply Co.
Los Angeles, California

Industrial Foundry Supply Co.
San Francisco, California

Klein-Farris Co., Inc.
Boston, Massachusetts
New York, New York
Hartford, Connecticut

LaGrand Industrial Supply Co.
Portland, Oregon

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Southwest Foundry Supply Co.
Houston, Texas

Mr. B. J. Steelman
Chicago, Illinois

Stoller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

Mr. Walter A. Zeis
Webster Groves, Missouri

BAROID
SALES DIVISION
NATIONAL LEAD COMPANY

BENTONITE SALES OFFICE:
RAILWAY EXCHANGE BLDG.
CHICAGO 4 • ILLINOIS

Index to Advertisers

American Air Filter Co., Inc. . 15
American Cyanamid Co. . . . 7
Baroid Sales Div., National Lead Co. 94
Beardsley & Piper Co. 87
Carborundum Co., The . . . 8-9
Cleveland Flux Co. 13
Climax Molybdenum Co. . . . 88
Delta Oil Products Co. 85
Detroit Electric Furnace Div., Kuhlman Electric Co. . . . 81
Dougherty Lumber Co. 93
Eastern Clay Products, Inc. . . 17
Electro Metallurgical Co. . . . 16
Federal Foundry Supply Co. . 1
Federated Metals Div., American Smelting & Refining Co. 10
Girdler Corp. 5
International Nickel Co. . . . 12
Kawin, Chas. C., Co. 95
Knight, Lester B., & Associates, Inc. 93
Krause, Chas. A., Milling Co. . 6
Lavin, R., & Sons, Inc. 91
National Carbon Co., Inc. . . 14
National Engineering Co. . . . 18
Niagara Falls Smelting & Refining Div., Continental United Industries Co., Inc. . 89
Oliver Machinery Co. 92
Pittsburgh Lectromelt Furnace Corp. . . . Inside Front Cover
Schneible, Claude B., Co. . . . 86
Scientific Cast Products Corp. . 92
Smith, Werner G., Co. . . Inside Back Cover
Tamms Industries, Inc. 90
Tousey Varnish Co. 4
Union Carbide & Carbon Corp. 16
U. S. Graphite Co. 11
Universal Engineering Co. . . 83
Wheland Co. 92
Whiting Corp. . . . Back Cover

A.F.S. Publications

Foundry Sand Testing Handbook 90
Recommended Practices for the Sand Casting of Non-Ferrous Alloys . . . 93
A.F.S. Book Listing 95

CHAPTER ACTIVITIES

(Continued from Page 93)

important, according to Mr. Booth, because a rough surface offers resistance and prevents sufficient ramming.

Questions on pH in relation to various types of sand, and a discussion of moisture content vs. strength of bentonite concluded the program.

N. Illinois–S. Wisconsin

Jerry M. Zilka
Gunite Foundries Corp.
Technical Secretary

THE SECOND DINNER meeting of the Chapter for the season was held at the Hotel Freeport, Freeport, Ill., October 11, with S. C. Massari, A.F.S. Technical Director, as speaker.

Mr. Massari showed the A.F.S. research film *"Fluid Flow in Transparent Molds"* and added descriptive dialogue as the film was being shown. The study, photographed by Battelle Memorial Institute, was on the hydraulics of flow in molds. The results of the study are particularly important to the aluminum and magnesium foundries because they demonstrate clearly how hydraulics can reduce the oxidation of the metal by eliminating turbulent flow. The study is also applicable to the ferrous foundries, not primarily because of the oxidation problem, but because it indicates what constitutes good gating design.

It was demonstrated that air can be introduced to the metal stream through two channels. The first is through the sprue and the second through the voids in the sand. Air is entrapped in the stream at the sprue in two ways: by turbulent flow, and through the formation of a vortex or whirlpool.

These avenues of entry can be eliminated, it was shown, by proper sprue lip design and by proper pouring speed and pouring technique. Via the sand voids, air is introduced into the metal stream whenever the atmospheric pressure exceeds the hydrostatic pressure of the stream.

It was shown that the length and taper of the down sprue played an important part in building up the pressure of the metal stream so that it was possible to exceed the atmospheric pressure.

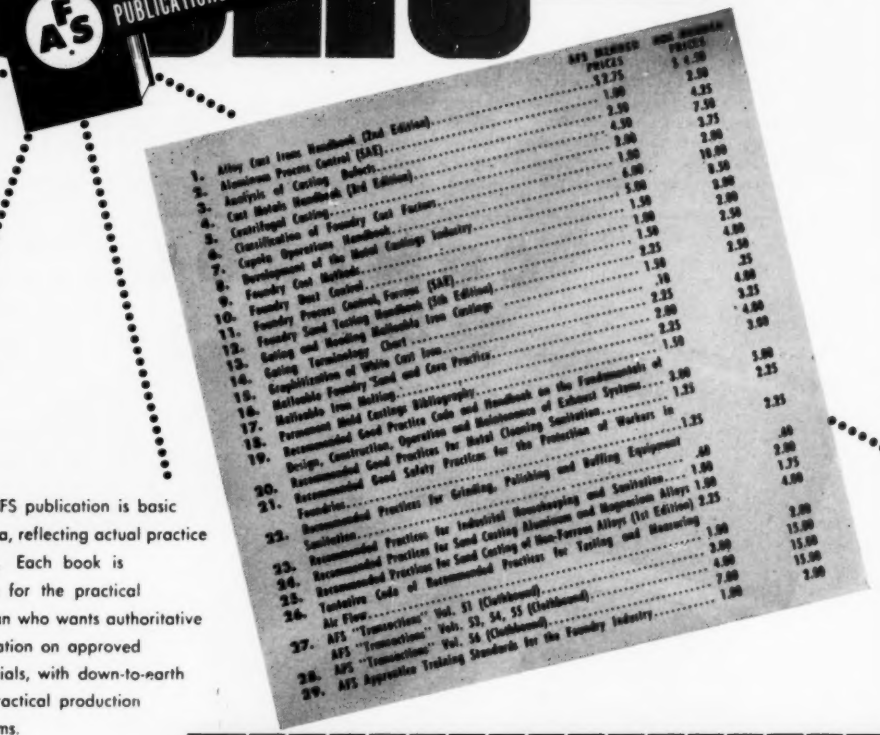
In general, positive tapered sprues (small end down) tend to prevent the admittance of air through the sand whereas negative tapered sprues or straight sprues tend to promote the admittance of air through the sand. Air can also be admitted through the sand at points other than the sprue area. Along the runner, for example, air could be introduced if the metal flow became turbulent, thereby reducing the hydrostatic pressure. Abrupt changes in direction are responsible for most turbulent flow within the runner length, therefore streamlining of the runner channel is the best solution.

To summarize, the oxidation of castings or the gas inclusions in castings can be reduced by preventing the entrapment of gases at the sprue through proper sprue lip design, preventing the formation of a vortex by proper pouring practices, preventing the formation of turbulence within the runner through streamlining, and by preventing the breathing of air and gases through the elimination of harmful pressure differentials.

It was also announced that the Chapter will sponsor an Apprentice Contest. The contest will include wood and metal patternmaking, gray iron and steel molding, and non-ferrous molding. The contest is open to certified foundry apprentices not more than 24 years old. Membership in the chapter is not a pre-requisite.

BOOKS

PUBLICATIONS TO MEET THE CURRENT NEEDS OF THE FOUNDRY INDUSTRY



		AFS MEMBER PRICES	NON-MEMBER PRICES
1.	Alloy Cast Irons Handbook (2nd Edition)	$3.75	$ 4.50
2.	Aluminum Process Control (SAE)	1.00	2.50
3.	Analysis of Casting Defects	2.50	4.25
4.	Cast Metals Handbook (3rd Edition)	4.50	7.50
5.	Centrifugal Casting	2.00	3.75
6.	Classification of Foundry Cost Factors	1.50	2.00
7.	Cupola Operations Handbook	6.00	10.00
8.	Development of the Metal Castings Industry	5.00	8.50
9.	Foundry Cost Methods	1.50	3.00
10.	Foundry Dust Control	1.00	2.00
11.	Foundry Process Control, Ferrous (SAE)	1.50	2.50
12.	Foundry Sand Testing Handbook (5th Edition)	2.25	4.00
13.	Gating and Risering Methods for Iron Castings	1.50	2.50
14.	Gating Terminology Chart	.25	.25
15.	Graphitization of White Cast Iron	.10	4.00
16.	Malleable Foundry Sand and Core Practice	2.25	3.25
17.	Malleable Iron Melting	2.00	4.00
18.	Permanent Mold Castings Bibliography	2.25	3.00
19.	Recommended Good Practice Code and Handbook on the Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems	1.50	
20.	Recommended Good Practices for Metal Cleaning Sanitation	3.00	5.00
21.	Recommended Good Safety Practices for the Protection of Workers in Foundries	1.25	2.25
22.	Recommended Practices for Grinding, Polishing and Buffing Equipment	1.25	
23.	Sanitation	.60	.60
24.	Recommended Practices for Industrial Housekeeping and Sanitation	1.00	2.00
25.	Recommended Practices for Sand Casting Aluminum and Magnesium Alloys	1.50	1.75
26.	Recommended Practices for Sand Casting of Non-Ferrous Alloys (1st Edition)	2.25	4.00
27.	Tentative Code of Recommended Practices for Testing and Measuring Air Flow	1.00	2.00
28.	AFS "Transactions" Vol. 51 (Clothbound)	3.00	15.00
29.	AFS "Transactions" Vols. 53, 54, 55 (Clothbound)	4.00	15.00
	AFS "Transactions" Vol. 56 (Clothbound)	7.00	15.00
	AFS Apprentice Training Standards for the Foundry Industry	1.00	2.00

Every AFS publication is basic data, reflecting actual practice in industry. Each book is written for the practical foundryman who wants authoritative information on approved techniques and materials, with down-to-earth application to practical production problems.

Check the list of "How-to-Do-It" books to be sure that you have a complete library for ready reference.

AMERICAN FOUNDRYMEN'S SOCIETY
222 WEST ADAMS ST.
CHICAGO 6, ILLINOIS

Please send the books circled below. $_____ remittance enclosed.

1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
27 (Vol. 51, Vol. 53, Vol. 54, Vol. 55) 28 29

Name

Address

City Zone State

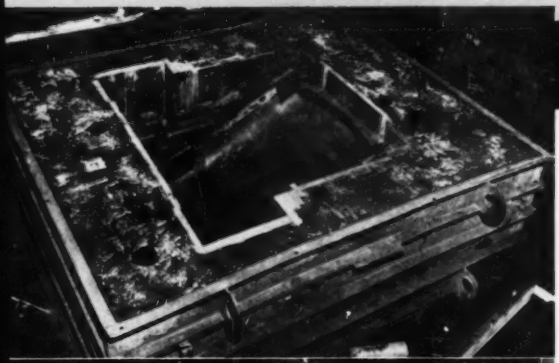
Company

AFS pays postage when remittance accompanies order.

AUTO BODY DIES

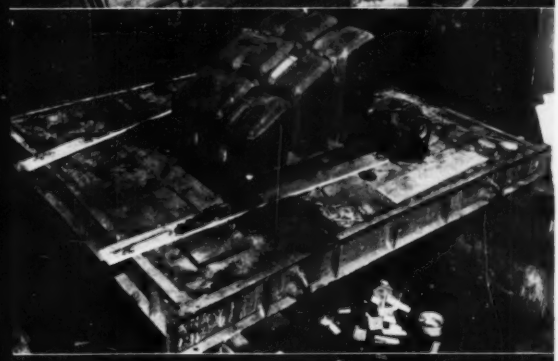
are made with LINOIL

AT CENTRAL IRON FOUNDRY
• OF DETROIT •



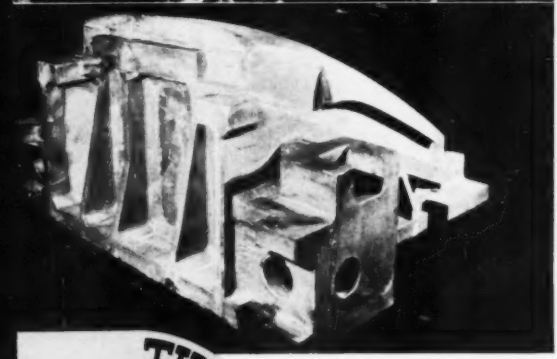
•• the DRAG

Made by banking the pattern with LINOIL-bonded core sand, then facing the vertical pattern surfaces with LINOIL "slab" cores.



•• the COPE

LINOIL chunk cores are wired to seats in the cope and will hang down inside the mold. They are used to lighten the casting weight.



•• the CASTING

A 9-ton roof panel trim die. Cast in gray iron, this punch gets extra toughness from ladle additions of vanadium and molybdenum.

THE LINOIL — THE LOGICAL OIL

WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

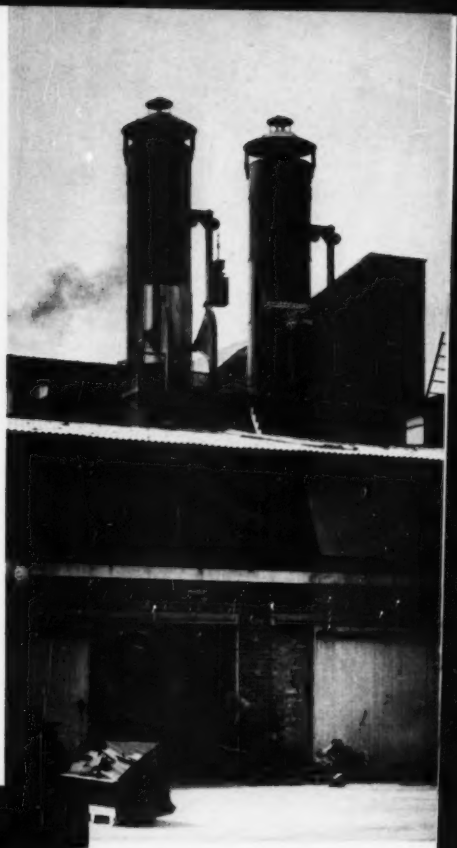
2191 WEST 110th STREET • CLEVELAND 2, OHIO

Smaller Foundries, too

ARE BENEFITING FROM WHITING-ENGINEERED MECHANICAL CHARGING

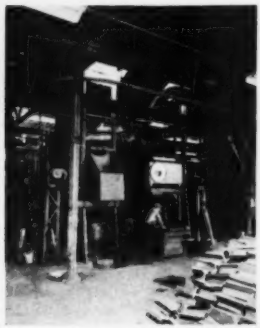
TODAY, mechanical charging is reducing costs and improving working conditions in scores of smaller foundries —plants which pour no more than 5 to 25 tons per day. No need to envy the "big fellows" . . . Whiting engineers will gladly show how YOU can use mechanization economically and profitably.

Whiting Charging Installations begin with simple skip hoists, bucket loaders, and other inexpensive equipment that small foundries can use to advantage. No operation is too small to receive our careful attention. Why not ask for our suggestions?



These two Whiting #4 Cupolas are served by side-dump skip hoist chargers

Bottom-dump scale-lorry suspended from monorail . . . shown in material yard



Here the monorail lorry discharges into the skip hoist charging bucket

WHITING CORPORATION

15628 Lathrop Ave., Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.

WHITING MAKES ALL TYPES OF MECHANICAL CHARGERS

SIDE-DUMP SKIP | UNDERSLUNG CRANE | "VM" SKIP | MONORAIL CRANE | JIB CRANE | SWIVEL SKIP | HORSESHOE TROLLEY | GANTRY CRANE | OVERHUNG CRANE